UNIT 1

PERCENTAGE, RATIO AND PROPORTION

SHORT QUESTIONS

Q.1- Define Percentage. Also give example.

Ans. The word " Percent " means out of hundred or per hundred. The symbol for percentage is % .

Example:

Ahmad takes a test and gets 14 marks out of 20. Find the marks percentage?

Solution:- Marks obtained = 14

$$\text{Marks percentage} = \frac{14}{20}\times 100\%$$
$$= 14\times 5\%$$
$$= 70\%$$

Q.2- How do a percentage and fraction can be interconverted?

Ans. Percentage is converted into fraction by dividing it by 100. Let us consider

$$20\% = \frac{20}{100} = \frac{1}{5}$$

$$50\% = \frac{50}{100} = \frac{1}{2}$$

Similarly common fraction is converted to percentage by multiplying it by 100

Example:

$$\frac{3}{5}=\frac{3}{5}\times 100\%=60\%$$

$$\frac{16}{25}=\frac{16}{25}\times 100\%=64\%$$

Q.3- If $\frac{4}{5}$ of the students in a school have been away for a holiday. How many out of every hundred have been on holiday?

Solution:-

$$\frac{4}{5}=\frac{4}{5}\times 100\%=80\%$$

Thus *80* students out of every *100* have been on holiday.

Q.4- If 56 % of the homes in a colony have a car. What % age of homes do not have a car?

Solution:-

Total number of homes in the colony = *100 %*

Number of homes having cars = *56 %*

Number of homes having no car = *100 % − 56 %*

= *44 %*

Q.5- Explain the term "ratio" also give an example.

Ans. Ratio is a comparison of two or more like quantities measured in like units. The symbol for ratio is ":". If a and b represent two magnitudes of a quantity where b is not zero then ratio of a to b is written as $a : b$ or $\frac{a}{b}$.

Q.6- Define Antecedent and Consequent in a ratio.

Ans. In a ratio "$a : b$" the first quantity 'a' is called antecedent and the *2*nd quantity 'b' is called consequent.

Q.7- In what ratio $60\,m^2$ be decreased to $24\,m^2$?

Solution:-

Required ratio $= 24:60$

$= 2:5$

Q.8- There are 1029 students in a school. 504 of them are girls. Find the ratio of boys to the girls.

Solution:-

Total number of student $= 1029$

Number of girls $= 504$

Number of boys $= 1029 - 504$

$= 525$

Required ratio = Number of boys : Number of girls

$= 525:504$

$= 175:168$

$= 25:24$ Ans.

Q.9- Define proportion.

Ans. The equalities of two ratios is called proportion.

Example:

$3:5$ and $9:15$ are equal ratios. So we can write

$3:5 :: 9:15$

Q.10- Find the value of 'x' if x : 3 : : 60 : 15

Solution:- We have

$x:3::60:15$

$$\frac{x}{3}=\frac{60}{15}$$

$$x=\frac{60\times 3}{15}=12$$

Q.11- What are the types of proportions?

Ans. There are three kinds of proportions

(i) Direct proportion *(ii)* Inverse proportion.

(iii) Compound proportion.

Q.12- Define "Direct proportion"

Ans. The quantitative relationship between two quantities such that increase in one quanitity causes a proportional increase in the other quantity, is called direct proportion.

Q.13- Define "Inverse proportion"

Ans. The quantitative relationship between two quantities such that increase in one quantity causes a proportional decrease in the other quantity or decrease in one quantity causes a proportional increase in the other quantity, is called inverse proportion.

Q.14- What do you know about compound proportion?

Ans. When one quantity is proportional to more than one quantities either direct or inverse, then the proportion is called compound proportion.

SOLVED EXERCISES

EXERCISE 1.1

Q.1- Express the following percentages as fractions in their lowest form.

(i) 95% (ii) 65% (iii) 75% (iv) 25% (v) 56%

(vi) 48% (vii) 8% (viii) $33\frac{1}{2}\%$ (ix) $37\frac{1}{2}\%$

(x) $87\frac{1}{2}\%$ (xi) $5\frac{1}{4}\%$ (xii) $42\frac{1}{4}\%$

Solution:-

(i) $95\% = \frac{95}{100} = \frac{5\times19}{5\times20} = \frac{19}{20}$ Ans.

(ii) $65\% = \frac{65}{100} = \frac{5\times13}{5\times20} = \frac{13}{20}$ Ans.

(iii) $75\% = \frac{75}{100} = \frac{3\times25}{4\times25} = \frac{3}{4}$ Ans.

(iv) $25\% = \frac{25}{100} = \frac{25\times 1}{25\times 4} = \frac{1}{4}$ Ans.

(v) $56\% = \frac{56}{100} = \frac{14\times 4}{25\times 4} = \frac{14}{25}$ Ans.

(vi) $48\% = \frac{48}{100} = \frac{12\times 4}{25\times 4} = \frac{12}{25}$ Ans.

(vii) $8\% = \frac{8}{100} = \frac{2\times 4}{25\times 4} = \frac{2}{25}$ Ans.

(viii) $33\frac{1}{2}\% = \frac{67}{2}\% = \frac{67}{2\times 100} = \frac{67}{200}$ Ans.

(ix) $37\frac{1}{2}\% = \frac{75}{2}\% = \frac{75}{2\times 100} = \frac{3\times 25}{2\times 4\times 25} = \frac{3}{8}$ Ans.

(x) $87\frac{1}{2}\% = \frac{175}{2}\% = \frac{175}{2\times 100} = \frac{25\times 7}{2\times 4\times 25} = \frac{7}{8} = \frac{7}{8}$ Ans.

(xi) $5\frac{1}{4}\% = \frac{21}{4}\% = \frac{21}{4\times 100} = \frac{21}{400}$ Ans.

(xii) $42\frac{1}{2}\% = \frac{85}{2}\% = \frac{85}{2\times 100} = \frac{17\times 5}{2\times 20\times 5} = \frac{17}{40}$ Ans.

Q.2- Express the following fractions as percentage, giving your answer correct to 1 decimal place, where necessary.

(i) $\frac{3}{4}$ (ii) $\frac{3}{5}$ (iii) $\frac{4}{25}$ (iv) $\frac{13}{20}$ (v) $\frac{31}{25}$ (vi) $\frac{21}{40}$

(vii) $\frac{23}{60}$ (viii) $\frac{8}{3}$ (ix) $\frac{8}{5}$ (x) $\frac{7}{8}$ (xi) $\frac{5}{8}$ (xii) $\frac{3}{8}$

Solution:-

(i) $\frac{3}{4} = \frac{3}{4}\times 100\% = \frac{3\times 25\times 4}{4}\% = 75\%$ Ans.

(ii) $\frac{3}{5} = \frac{3}{5}\times 100\% = \frac{3\times 20\times 5}{5}\% = 60\%$ Ans.

(iii) $\frac{4}{25}=\frac{4}{25}\times 100\%=\frac{4\times 4\times 25}{25}\%=16\%$ Ans.

(iv) $\frac{13}{20}=\frac{13}{20}\times 100\%=65\%$ Ans.

(v) $\frac{31}{25}=\frac{31}{25}\times 100\%=124\%$ Ans.

(vi) $\frac{21}{40}=\frac{21}{40}\times 100\%=\frac{105}{2}\%=52.5\%$ Ans.

(vii) $\frac{23}{60}=\frac{23}{60}\times 100\%=\frac{115}{3}\%=38\frac{1}{3}\%$ Ans.

(viii) $\frac{8}{3}=\frac{8}{3}\times 100\%=\frac{800}{3}\%=266.66\%$ Ans.

(ix) $\frac{8}{5}=\frac{8}{5}\times 100\%=160\%$ Ans.

(x) $\frac{7}{8}=\frac{7}{8}\times 100\%=\frac{175}{2}\%=87.5\%$ Ans.

(xi) $\frac{5}{8}=\frac{5}{8}\times 100\%=\frac{125}{2}\%=62.5\%$ Ans.

(xii) $\frac{3}{8}=\frac{3}{8}\times 100\%=\frac{75}{2}\%\quad 37.5\%$ Ans.

Q.3- Express the following fractions as percentage, give your answer correct to 3 places of decimal.

***(i)* 47% *(ii)* 58% *(iii)* 92% *(iv)* 8% *(v)* 12%**

***(vi)* 120% *(vii)* 180% *(viii)* 145% *(ix)* $5\frac{1}{2}\%$**

***(x)* $5\frac{1}{3}\%$ *(xi)* $48\frac{2}{3}\%$ *(xii)* $58\frac{1}{3}\%$**

Solution:-

(i) $47\%=\frac{47}{100}=0.47$ Ans

(ii) $58\%=\frac{58}{100}=0.58$ Ans

(iii) $92\% = \frac{92}{100} = 0.92$ Ans

(iv) $8\% = \frac{8}{100} = 0.08$ Ans

(v) $12\% = \frac{12}{100} = 0.12$ Ans

(vi) $120\% = \frac{120}{100} = 1.20$ Ans

(vii) $180\% = \frac{180}{100} = 1.80$ Ans

(viii) $145\% = \frac{145}{100} = 1.45$ Ans

(ix) $5\frac{1}{2}\% = 5.5\% = \frac{5.5}{100} = 0.055$ Ans

(x) $5\frac{1}{3}\% = 5.33\% = \frac{5.33}{100} = 0.0533$ Ans

(xi) $48\frac{2}{3}\% = 48.67\% = \frac{48.67}{100} = 0.4867$ Ans

(xii) $58\frac{1}{3}\% = 58.33\% = \frac{58.33}{100} = 0.5833$ Ans

Q.4- Express the following decimals as percentages.
***(i)* 0.5 *(ii)* 0.9 *(iii)* 1.25 *(iv)* 1.39 *(v)* 1.72 *(vi)* 0.22 *(vii)* 2.64 *(viii)* 3.41 *(ix)* 0.845 *(x)* 1.78 *(xi)* 1.58 *(xii)* 0.065**

Solution:-

(i) $0.5 = 0.5 \times 100\% = 50\%$ Ans

(ii) $0.9 = 0.9 \times 100\% = \frac{9}{10} \times 100\% = 90\%$ Ans

(iii) $1.25 = 1.25 \times 100\% = \frac{125}{10} \times 100\% = 125\%$ Ans

(iv) $1.39 = 1.39 \times 100\% = \frac{139}{100} \times 100\% = 139\%$ Ans

(v) $1.72 = 1.72 \times 100\% = \frac{172}{100} \times 100\% = 172\%$ Ans

(vi) $0.22 = 0.22 \times 100\% = \frac{22}{100} \times 100\% = 22\%$ Ans

(vii) $2.64 = 2.64 \times 100\% = \frac{264}{100} \times 100\% = 264\%$ Ans

(viii) $3.41 = 3.41 \times 100\% = \frac{341}{100} \times 100\% = 341\%$ Ans

(ix) $0.845 = 0.845 \times 100\% = \frac{845}{1000} \times 100\% = \frac{845}{10}\%$

$= 84.5\%$ Ans

(x) $1.78 = 1.78 \times 100\% = \frac{178}{100} \times 100\% = 178\%$ Ans

(xi) $1.58 = 1.58 \times 100\% = \frac{158}{100} \times 100\% = 158\%$ Ans

(xii) $0.065 = 0.065 \times 100\% = \frac{65}{1000} \times 100\%$

$= \frac{65}{10}\% = 6.5\%$ Ans

Q.5- Complete the following table:

	Fraction	Percentage	Decimal
1.	$\frac{3}{4}$	$\frac{3}{4} \times 100\% = 75\%$	$\frac{75}{100} = 0.75$
2.	$\frac{4}{5}$	$\frac{4}{5} \times 100\% = 80\%$	$\frac{80}{100} = 0.80$
3.	$\frac{40}{100} = \frac{2}{5}$	40%	$\frac{40}{100} = 0.40$
4.	$\frac{62}{100} = \frac{31}{50}$	$\frac{62}{100} = 62\%$	0.62
5.	$\frac{44}{100} = \frac{11}{25}$	44%	0.44

EXERCISE 1.2

Q.1- If 45% of the students in a school are girls. What percentage are boys?

Solution:-

All the students in the school = *100 %*

Girls students = *45 %*

Boys students = *100 % − 45 %* = *55 %* Ans.

Q.2- If 82% of the houses have a television, what percentage does not have?

Solution:- Number of houses = *100 %*

Number of having T.V = *82 %*

Number of having no T.V = *100 % − 82 %*

= *18 %* Ans.

Q.3- A hockey team won 62% of their matches and 26% of them were ended in a draw. What percentage of the matches they lost?

Solution:-

Number of matches played = *100 %*

Number of matches won = *62 %*

Number of matches ended in a draw = *26 %*

Number of matches lost = *100 % − 62 % −26 %*

= *12 % Ans.*

Q.4- An aeroplane carries 400 passengers, 52% of the passengers were Pakistani, 17% were Chinese, 12% were from Iran and the rest were from British.

(i) **How many people of each nationality were on the plane?**

(ii) **What percentage were British?**

Solution:-

(i) Total number of passengers = *400*

Pakistani passengers = *52 %* = 52% of *400*

$$\frac{52}{100}\times 400 = 208 \text{ Passengers Ans.}$$

Chinese passengers = 17% of 400

$$= \frac{17}{100}\times 400 = 68 \text{ Passengers Ans.}$$

Passengers from Iran = 12% of 400

$$= \frac{12}{100}\times 400 = 48 \text{ Passengers Ans.}$$

Remaining British were = $400 - 208 - 68 - 48$

$= 76$ Passengers Ans.

Percentage of British $= \frac{76}{400}\times 100 = 19\%$

Q.5- Amna scored 46 out of 50 in a Math test, 64 out of 75 in a Chemistry test and 72 out of 80 in a Physics test. In which subject did she perform best?

Solution:-

% age of scores in math $= \frac{46}{50}\times 100 = 92\%$

% age of scores in Chemistry $= \frac{64}{75}\times 100 = 85.3\%$

% age of scores in Physics $= \frac{72}{80}\times 100 = 90\%$

Thus the greatest percentage is 92% in Math. So Amna performed the best in Maths. Ans.

Q.6- A table costs a carpenter Rs. 720 to make. He sells it for Rs. 920. What percentagc of profit does he earn?

Solution:-

C. P = Rs 720

S. P = Rs 920

Profit = Rs 920 – Rs 720 = Rs 200

% age of Profit $= \frac{\text{Profit.}}{\text{C.P}}\times 100$

$$= \frac{200}{720} \times 100 = \frac{250}{9} = 27.78\ \%\ \text{Ans.}$$

Q.7- If 8.4 % of a book consists of 42 pages. Find total number of pages in the book?

Solution:-

$8.4\ \%$ of book contains number of pages $= 42$

So, $\frac{8.4}{100}$ of book contains number of pages $= 42$

Total number of pages in book $= 42 \times \frac{100}{8.4}$

$$= \frac{42 \times 1000}{84} = 500\ \text{Pages Ans.}$$

Q.8- Out of his total income, Hamza spends 20% on house rent and 70% of the rest on household expenditures. If he saves Rs. 1800, What is his total income?

Solution:-

Let x rupees be the total income

Rent $= 20\ \%$ of x

Rest of the income $= 80\ \%$ of x

$$= \frac{80}{100} \times x = \frac{4x}{5}$$

Expenditure on house hold $= 70\ \%$ of $\frac{4x}{5}$

Saving $= 30\ \%$ of $\frac{4x}{5}$

Thus according to the given condition.

$$30\ \% \text{ of } \frac{4x}{5} = 1800$$

$$\frac{30}{100} \times \frac{4x}{5} = 1800$$

$$x = \frac{1800 \times 100 \times 5}{30 \times 4} = 7500$$

$x =$ Rs. 7500 Ans.

Q.9- Raheel's income is 25 % more than that of Rauf. What percent is Rauf's income less than Raheel's?

Solution:- Let us suppose

Rauf's income = Rs. 100

Then Raheels income = Rs. 125

% age of difference age w.r.t Raheels income.

$$= \frac{\text{Difference.}}{\text{Raheel's income}} \times 100$$

$$= \frac{25}{125} \times 100 = 20\% \text{ Ans.}$$

EXERCISE 1.3

Q.1- Find the ratio of first quantity to the second in its lowest terms.

***(i)* Rs. 24, Rs. 6 *(ii)* 20 kg, 5kg *(iii)* 20cm, 80 cm**

***(iv)* 5m, 5m *(v)* 1500 km, 1200 km**

***(vi)* Rs. 150, Rs. 275**

Solution:-

(i) $Rs.\ 24 : Rs.\ 6 = 24 : 6 = \frac{24}{6} = \frac{4}{1} = 4 : 1$ Ans.

(ii) $20\ kg : 5\ kg = 20 : 5 = \frac{20}{5} = \frac{4}{1} = 4 : 1$ Ans.

(iii) $20cm, 80\ cm = 20 : 80 = \frac{20}{80} = \frac{1}{4} = 1 : 4$ Ans.

(iv) $5m, 5m = 5 : 5\ \frac{5}{5} = \frac{1}{1} = 1 : 1$ Ans.

(v) $1500\ km, 1200\ km = \frac{1500}{1200} = \frac{5}{4} = 5 : 4$ Ans.

(vi) Rs. 150, Rs. 275 $= \frac{150}{275} = \frac{6}{11} = 6 : 11$ Ans.

Q.2- Express each of the following ratios in its simplest form.

(i) $\frac{2}{3} : \frac{3}{5}$ **(ii)** $\frac{4}{5} : \frac{3}{4}$ **(iii)** $\frac{5}{6} : \frac{7}{10}$

(iv) $\frac{13}{40} : \frac{3}{20}$ **(v)** $\frac{2}{3} : \frac{1}{6}$ **(vi)** $\frac{4}{10} : 20$

(vii) $\frac{15}{10} : 2$ **(viii)** $\frac{12}{10} : \frac{28}{10}$ **(ix)** $\frac{2}{5} : \frac{1}{3}$

Solution:-

(i) $\frac{2}{3} : \frac{3}{5} = 15 \times \frac{2}{3} : \frac{3}{5} \times 15$ (Multiply by L.C.M = 15)

$= 10 : 9$ Ans.

(ii) $\frac{4}{5} : \frac{3}{4}$

$= 20 \times \frac{4}{5} : \frac{3}{4} \times 20$ (Multiply by L.C.M = 20)

$= 16 : 15$ Ans.

(iii) $\frac{5}{6} : \frac{7}{10}$

$= 30 \times \frac{5}{6} : \frac{7}{10} \times 30$ (Multiply by L.C.M = 30)

$= 25 : 21$ Ans.

(iv) $\frac{13}{40} : \frac{3}{20}$

$= 40 \times \frac{13}{40} : \frac{3}{20} \times 40$ (Multiply by L.C.M = 40)

$= 13 : 6$ Ans.

(v) $\frac{2}{3} : \frac{1}{6}$

$= 6 \times \frac{2}{3} : \frac{1}{6} \times 6$ (Multiply by L.C.M = 6) $= 4 : 1$ Ans.

(vi) $\frac{4}{10} : 20$

$= \frac{2}{5} : \frac{20}{1} = 2 : 100$ (Multiply by L.C.M = 5)

$= 1 : 50$ Ans.

(vii) $\frac{15}{10} : 2$

$= \frac{3}{2} : \frac{2}{1}$ (Multiply by L.C.M = 2) $= 3 : 4$ Ans.

(viii) $\frac{12}{10} : \frac{28}{10}$ (Multiply by L.C.M = 10)

$= 12 : 28 \quad = 3 : 7$ Ans.

(ix) $\frac{2}{5} : \frac{1}{3}$

$= 15 \times \frac{2}{5} : 15 \times \frac{1}{3}$ (Multiply by L.C.M = 15)

$= 6 : 5$ Ans.

Q.3- In a city 126 medical students traveled by:

Rikshaw	Taxi	Bus	Car
14	9	75	28

Find ratio of the students who used.

(i) Rikshaw to taxi **(ii) Taxi to bus**

(iii) Taxi to car.

Solution:-

(i) Rikshaw : Taxi

14 : 9 Ans.

(ii) Taxi : Bus

9 : 75 Ans.

3 : 25

(iii) Taxi : Car

9 : 28 Ans.

Q.4- In a school library, there are 75 books on Mathematics, 115 on English, 85 on Chemistry and 60 on Physics. Find ratio of the following:

- *(i)* **Mathematics books to English books.**
- *(ii)* **English books to Chemistry books.**
- *(iii)* **English books to Physics books.**
- *(iv)* **Physics books to Chemistry books.**
- *(v)* **Physics books to Mathematics books.**
- *(vi)* **Chemistry books to Mathematics books.**

Solution:-

(i) Math Books : Eng Books
75 : 115
15 : 23 (Divided by 5)

(ii) Eng Books : Chemistry Books
115 : 85
23 : 17 (Divided by 5)

(iii) Eng Books : Physics Books
115 : 60
23 : 12 (Divided by 5)

(iv) Physics Books: Chemistry Books
60 : 85
12 : 17 (Divided by 5)

(v) Physics Books: Math Books
60 : 75
4 : 5 (Divided by 5)

(vi) Chemistry Books : Math Books
85 : 75
17 : 15 (Divided by 5)

EXERCISE 1.4

Q.1- Find the ratio of 6 rupees each to 72 rupees per dozen.

Solution:-

6 Rupees each : 72 Rupees per dozen
= 72 Rupees per dozen : 72 Rupees per dozen
= 1 : 1 Ans.

Note :- 6 rupees each means 72 rupees per dozen.

Q.2- Find the ratio of Rs. 160 per meter to Rs. 150 per meter.

Solution:- Rs. 160 per meter : Rs. 150 per meter
= 160 : 150
= 16 : 15 Ans.

Q.3- Find the ratio of Rs. 72 for 24 to rupees 4 each?

Solution:-

Rs. 72 for 24 : Rs. 4 each
= Rs. 3 each : Rs. 4 each
= 3 : 4 Ans.

Note :- Rs. 72 for 24 means Rs. 3 each.

Q.4- A square 'A' has side 2 cm and a square 'B' has side 6cm. Find ratio of:

- ***(i)*** **The length of the side of the square 'A' to the length of the side of the square 'B'.**
- ***(ii)*** **The perimeter of the square 'A' to the perimeter of the square 'B'.**
- ***(iii)*** **The area of the square 'A' to the area of the square 'B'.**

Solution:-

(i) Length of side of A : Length of side of B
2 cm : 6 cm
= 2 : 6
= 1 : 3 Ans.

(ii) Perimeter of A : Perimeter of B

4×2 cm : 4×6 cm

$= 8 : 24$

$= 1 : 3$ Ans.

(iii) Area of A : Area of B

$(2\,cm)^2 : (6\,cm)^2$

$= 4 : 36$

$= 1 : 9$ Ans.

Q.5- If a : b = 2 : 3, find the ratio 6a : 2b.

Solution:-

$a : b = 2 : 3$

$= \frac{a}{b} = \frac{2}{3}$

Multiply by $\frac{6}{2}$ on both sides.

$= \frac{6a}{2b} = \frac{6 \times 2}{2 \times 3} = \frac{2}{1}$

$6a : 2b = 2 : 1$ Ans.

Q.6- A triangle has sides of lengths 3cm , 4cm and 6cm. Find the ratio of the lengths of the sides to one another.

Solution:-

Let the length of three sides of triangle be named as a, b, c

So

(i) $a : b = 3cm : 4cm$

$= 3 : 4$ Ans.

(ii) $b : c = 4cm : 6cm$

$= 2 : 3$ Ans.

(iii) $c : a = 6cm : 3cm$

$= 2 : 1$ Ans.

Q.7- Two angles in a triangle are 54^0 and 72^0. Find the ratio of the third angle to the sum of the first two?

Solution:-

Let $\alpha=54^0$, $\beta=72^0$

and the third angle $\gamma=?$

We know that

Sum of measure of three angles of a triangle is 180^0 so

$\alpha+\beta+\gamma=180^0$

$\gamma=180^0-\alpha-\beta$

$\gamma=180^0-54^0-72^0$

$=54^0$

Now

$\gamma:\alpha+\beta$

$54^0:72^0+54^0$

$=54^0:126^0$

$=3:7$ Ans.

Q.8- Ali's father earns a salary of Rs. 40,000 in a month, while his father's monthly expenditures are Rs. 35,000. Find the ratio of his father's:

(i) **Income to expenditure**

(ii) **Expenditure to savings**

(iii) **Income to savings**

Solution:-

Salary = Rs *40,000*

Expenditure = Rs *35,000*

Saving = Rs *40,000* – Rs *35,000*

= Rs *5000*

Now, required ratio's are

(i) Income : Expenditure = *40,000* : *35,000* $=8:7$ Ans.

(ii) Expenditure : Saving = *35,000* : *5,000* $=7:1$ Ans.

(iii) Income : Saving = *40,000* : *5,000* $=8:1$ Ans.

Q.9- **A square A has side 6cm and square B has side 8cm.**

Find the ratio of:

(i) The length of the side of a square A to the length of the side of the square B.

(ii) The area of square A to the area of square B

Solution:-

Length of the side of square A = $6cm$

Area of the square A $=(6cm)^2=36cm^2$

Length of the side of square B = $8cm$

Area of the square B $=(8cm)^2=64cm^2$

Required Ratios are

(i) Length of side of A : Length of side of B

$=6cm : 8cm = 3 : 4$ Ans.

(ii) Area of A : Area of B

$=36cm^2 : 64cm^2$

$= 9 : 16$ Ans.

Q.10- **A family has 12 pets of which 6 are cats, 2 are dogs and the rest are birds. Find the ratio of the number of:**

(i) birds to dogs

(ii) birds to pets

Solution:-

Number of pets = 12

Cats $=6$

Dogs $=2$

Birds $=12-6-2=4$

Ratios are

(i) Birds : Dogs $=4 : 2$

$=2 : 1$ Ans.

(ii) Birds : Pets $=4 : 12$

$=1 : 3$ Ans.

EXERCISE 1.5

Q.1- Find the value of x in the proportion 20: 50 :: 8 : x?

Solution:-

$$20 : 50 :: 8 : x$$
$$\Rightarrow \frac{20}{50} = \frac{8}{x}$$
$$\Rightarrow 20x = 8 \times 50$$
$$\Rightarrow x = \frac{8 \times 50}{20} = 20 \text{ Ans.}$$

Q.2- The price of 15 suits is Rs. 6750.How many such suits can be purchased by an amount of Rs 4050?

Solution:-

Let x suits can be purchased by an amount of Rs 4050.

Thus

Amounts	Suits
6750	15
4050 ↓	x ↓

The proportion is direct, so

$$6750 : 4050 :: 15 : x$$
$$\Rightarrow \frac{6750}{4050} = \frac{15}{x}$$
$$\Rightarrow 6750 \times x = 4050 \times 15$$
$$\Rightarrow x = \frac{4050 \times 15}{6750} = 9 \text{ Suits. Ans.}$$

Q.3- A motorcycle covers 90km in 2 liters of petrol. In how many liters of petrol will it cover 225km?

Solution:-

Let 225 km is covered in x liters of petrol. So

Distance (km),	Petrol (liters)
90	2
225 ↓	x ↓

The proportion is direct . So

$$90 : 225 :: 2 : x$$

$$\Rightarrow \frac{90}{225} = \frac{2}{x}$$

$$\Rightarrow 90 \times x = 225 \times 2$$

$$\Rightarrow x = \frac{225 \times 2}{90} = 5 \text{ Liter Ans.}$$

Q.4- A certain journey by train takes 5 hours at the speed of 45km/h. What will be the speed of the train to complete the same journey in 3 hours?

Solution:-

Let the speed by x km/h to complete the journey in 3 hours.

Thus	Time (hours)	Speed (km/h)
	↑ 5	45
	3	↓ x

The proportion is inverse . So

$$3 : 5 :: 45 : x$$

$$\Rightarrow \frac{3}{5} = \frac{45}{x}$$

$$\Rightarrow 3 \times x = 5 \times 45$$

$$\Rightarrow x = \frac{5 \times 45}{3} = 75 \text{ km/h Ans.}$$

Q.5- Six men can paint a house in four days. How long it would take to paint the house if three men are employed?

Solution:-

Men	Days
↑ 6	4
3	↓ x

Here , the proportion is inverse. So

$$3:6 \quad :: \quad 4:x$$

$$\Rightarrow \frac{3}{6}=\frac{4}{x}$$

$$\Rightarrow 3\times x=4\times 6$$

$$\Rightarrow x=\frac{4\times 6}{3}=8$$

$= 8$ Days Ans.

Q.6- A manager plans to produce 100 bicycles with the help of 25 persons working 4 hours daily. How many bicycle can be made by 40 persons if they work 3 hours daily?

Solution:-

Let, he can make x bicycles. So

Persons	Daily hours	Bicycles
25	4	100
40 ↓	3 ↓	x ↓

Both the proportions are direct.

So

$$\left\{\begin{matrix}25:40\\4:3\end{matrix}\right\}::100:x$$

Product of extremes = Product of means

$$\Rightarrow 25\times 4\times x= 40\times 3\times 100$$

$$x=\frac{40\times 3\times 100}{25\times 4}=120$$ bicycles Ans.

Q.7- A factory makes 560 fans in 7 days with the help of 20 machines. How many fans can be made in 12 days with the help of 18 machines ?

Solution:- Let x fans can be made. S.

Days	Machines	Fans
7	20	560
12 ↓	18 ↓	x ↓

Both the proportions are direct.

$$\left\{\begin{matrix} 7 & : 12 \\ 20 & : 18 \end{matrix}\right\} :: 560 : x$$

Product of extremes = Product of means

$$\Rightarrow 7\times 20\times x = 560\times 12\times 18$$

$$\Rightarrow x = \frac{560\times 12\times 18}{7\times 20} = 864 \text{ Fans Ans.}$$

Q.8- A factory makes 600 soaps in 9 days with the help of 20 machines. How many soaps can be made in 12 days with the help of 18 machines ?

Solution:-

Days	Machines	Soaps
9	20	600
12 ↓	18 ↓	x ↓

Both the proportions are direct so

$$\left\{\begin{matrix} 9 & : 12 \\ 20 & : 18 \end{matrix}\right\} :: 600 : x$$

Product of extremes = Product of means

$$\Rightarrow 9\times 20\times x = 12\times 18\times 600$$

$$\Rightarrow x = \frac{12\times 18\times 600}{9\times 20} = 720 \text{ Soaps Ans.}$$

Q.9- If the stay of 12men for 28 days in a hotel cost Rs6720. Find the cost for the stay of 7 men for 13 days.

Solution:-

Men	Days	Cost (Rs)
12	28	6720
8 ↓	14 ↓	x ↓

Both the proportions are direct. So

$$\left\{\begin{matrix} 12 & : 8 \\ 28 & : 14 \end{matrix}\right\} :: 6720 : x$$

Product of extremes = Product of means

$$\Rightarrow 12 \times 28 \times x = 8 \times 14 \times 6720$$

$$\Rightarrow x = \frac{8 \times 14 \times 6720}{12 \times 28} = 2240$$

= Rs. 2240. Ans

Q.10- If the stay of 14 men for 8 days in a hotel cost Rs. 22,400. Find the cost for the stay of 7 men for 13 days.

Solution:-

$$\begin{array}{cccccc} \text{Men} & & \text{Days} & & \text{Cost (Rs)} & \\ 14 & \Big\downarrow & 8 & \Big\downarrow & 22400 & \Big\downarrow \\ 7 & & 13 & & x & \end{array}$$

Both the proportions are direct. So

$$\left.\begin{array}{l} 14 : 7 \\ 8 : 13 \end{array}\right\} :: 22400 : x$$

Product of extremes = Product of means

$$\Rightarrow 14 \times 8 \times x = 22400 \times 7 \times 13$$

$$\Rightarrow x = \frac{22400 \times 7 \times 13}{14 \times 8}$$

$$\Rightarrow x = 18200$$

= Rs. 18200 Ans.

Q.11- 14 cows consume 63kg of hay in 18 days. How many cows will eat 770kg of hay in 28 days at the same rate?

Solution:-

$$\begin{array}{cccccc} \text{Hay (kg)} & & \text{Days} & & \text{Cows} & \\ 63 & \Big\downarrow & 18 & \Big\uparrow & 14 & \Big\downarrow \\ 770 & & 28 & & x & \end{array}$$

Hay and cows are directly proportional.

Days and cows are inversely proportional.

So

$$\left.\begin{matrix}63:770\\ 28:18\end{matrix}\right\} \quad :: \quad 14:x$$

Product of extremes = Product of means

$$\Rightarrow 63\times 28\times x = 14\times 770\times 18$$

$$\Rightarrow x = \frac{14\times 770\times 18}{63\times 28} = 110 \text{ Cows Ans.}$$

Q.12- Juice manufacturer produce 3000 bottles in a day employing 15 workers working 8 hours. Find the number of bottles manufactured when he employs 18 workers working 6 hours.

Solution:-

Workers	Hours	Bottles
15	8	3000
$18 \downarrow$	$6 \downarrow$	$x \downarrow$

Both the proportions are direct. So

$$\left.\begin{matrix}15:18\\ 8:6\end{matrix}\right] \quad :: \quad 3000:x$$

Product of extremes = Product of means

$$\Rightarrow 15\times 8\times x = 18\times 6\times 3000$$

$$\Rightarrow x = \frac{18\times 6\times 3000}{15\times 8}$$

$$\Rightarrow x = 2700 \text{ Bottles. Ans.}$$

REVIEW EXERCISE :1

Q.3- Encircle the correct answer.

(i) 20 % of 600 is:

(a) 12 (b) 120

(c) 20 (d) 200

(ii) Fraction form of 70 % is:

(a) 7 (b) $\frac{7}{10}$

(c) $\frac{10}{7}$ (d) ·7

(iii) $\frac{7}{20}$ in terms of percentage is:

(a) 35 % (b) 35

(c) 20 (d) 20 %

(iv) $\frac{1}{3}$ in terms of percentage is:

(a) 2 % (b) 1 %

(c) 33 % (d) $33\frac{1}{3}\%$

(v) 0.13 as percentage is:

(a) ·13 (b) 30

(c) 13 % (d) 10 %

(vi) In a ratio *a : b, "a"* is called:

(a) extreme (b) antecedent

(c) consequent (d) means

(vii) In a ratio *a : b, "b"* is called:

(a) extreme (b) means

(c) antecedent (d) consequent

(viii) In a proportion *a : b :: c : d, a* and *d* are called:

(a) extreme (b) means

(c) antecedent (d) consequent

(ix) In a proportion *a : b :: c : d, b* and *c* are called:

(a) means (b) extreme

(c) consequent (d) antecedent

(x) Lowest form of 75 : 95 is:

(a) 15 : 17 (b) 15 : 19

(c) 19 : 15 (d) 17 : 15

Ans:

(i) b	(ii) b	(iii) a	(iv) d
(v) c	(vi) b	(vii) d	(viii) a
(ix) a	(x) b		

Q.2- Fill in the blanks.

(i) 30 % of 1500 is __________

(ii) Fraction form of 15 % is __________

(iii) $\frac{7}{25}$ in terms of percentage is __________

(iv) $\frac{2}{3}$ in terms of percentage is __________

(v) 0.29 as percentage is __________

(vi) In a ratio $a : b$ "a" is called __________

(vii) In a ratio $a : b$ "b" is called __________

(viii) In a proportion $a : b :: c : d$, a and d are called ______

(ix) In a proportion $a : b :: c : d$, the product of extremes is equal to the product of __________

(x) The simplest form of $\frac{2}{3} : \frac{3}{5}$ is __________

Ans:

(i) 450	(ii) $\frac{3}{20}$	(iii) 28 %	(iv) 66.67%
(v) 29 %	(vi) Antecedent	(vii) Consequent	(viii) Extremes
(ix) Means	(x) 10 : 9		

Q.3- A railway train carries 800 passengers, 55% passengers are men, 15% are children. What is the percentage of women?

Solution:-

Percentage of Men = 55 %

Percentage of Children = 15 %

Percentage of Women = ?

$$\text{Percentage of Women} = 100\,\% - \%\text{ age of Men} - \%\text{ age of Children}$$

$$= 100\,\% - 55\,\% - 15\,\% = 30\,\%$$

Women = 30 % Ans.

Q.4- Azeem spends 25% of his income on house rent, 60% of the rest amount on household expenditure. If he saves Rs 2100, what is his total income?

Solution:-

Let x rupees be the total income.

House rent = 25 % of x

Remain amount = 75 % of x

$$= \frac{75}{100} \times x = \frac{3x}{4}$$

House hold expenditures = 60 % of $\frac{3x}{4}$

He saves = 40 % of $\frac{3x}{4}$

$$= \frac{40}{100} \times \frac{3x}{4} = \frac{3x}{10}$$

According to the given condition.

$$\text{Saving} = \frac{3x}{10} = \text{Rs. } 2100$$

$$\Rightarrow x = \frac{2100 \times 10}{3} = 7000$$

x = Rs. 7000

Total Income = 7000 Ans.

Q.5- In a school there are 220 student chairs, 110 student tables, 50 staff chairs and 30 staff tables. Find the ratio of the following

(i) **Students chairs to students tables.**

(ii) Students chairs to staff chairs.

(iii) Students tables to staff tables.

Solution:-

Students chairs = 220

Students tables = 110

Staff chairs = 50

Staff tables = 30

So

(i) Student chairs : students tables

$= 220 : 110 = 2 : 1$ Ans.

(ii) Student chairs : Staff chairs

$220 : 50$

$= 22 : 5$ Ans.

(iii) Students tables : Staff tables

$110 : 30$

$= 11 : 3$ Ans.

Q.6- Two angles in a triangle are 48° and 60°. find the ratio of the third angle to the sum of the first two angles.

Solution:-

Let x^0 be the measure of third and so we know

Sum of three angles of a triangle $= 180^0$

$\Rightarrow x^0 + 48^0 + 60^0 = 180^0$

$x^0 + 108^0 = 180^0$

$x^0 = 180^0 - 108^0 = 72^0$

Now required ratio is

Third angle : Sum of first two angles

$72^0 : 48^0 + 60^0 \Rightarrow 72 : 108$

$= 2 : 3$ Ans.

Q.7- 8 persons can do a job in 24 days, if 4 more persons join them, how much time they will take to complete the same job?

Solution:-

$$\begin{array}{cc} \text{Persons} & \text{Days} \\ \left.\begin{array}{c}8\\12\end{array}\right\uparrow & \left.\begin{array}{c}24\\x=?\end{array}\right\downarrow \end{array}$$

The proportion is inverse. So

$$12:8::24:x$$

$$\Rightarrow \frac{12}{8}=\frac{24}{x}$$

$$\Rightarrow 12\times x=24\times 8$$

$$\Rightarrow x=\frac{24\times 8}{12}=16 \text{ Days. Ans.}$$

Q.8- The stay of 18 students for 36 days in a hostel costs Rs. 58320. Find the cost for the stay of 9 students for 12 days.

Solution:-

$$\begin{array}{ccc} \text{Students} & \text{Days} & \text{Cost (Rs)} \\ \left.\begin{array}{c}18\\9\end{array}\right\downarrow & \left.\begin{array}{c}36\\12\end{array}\right\downarrow & \left.\begin{array}{c}58320\\x=?\end{array}\right\downarrow \end{array}$$

Both the proportions are direct

$$\left.\begin{array}{l}18:9\\36:12\end{array}\right]::58320:x$$

Product of extremes = Product of means

$$18\times 36\times x=9\times 12\times 58320$$

$$x=\frac{9\times 12\times 58320}{18\times 36}=9720$$

$x=$ Rs. 9720 *Ans.*

MULTIPLE CHOICE QUESTIONS

Q.1- Tick the correct answer.

(i) Percentage means

(a) Out of hundred *(b)* Per hundred

(c) $\frac{1}{100}$ times *(d)* All of these

Q.2- $45\frac{1}{2}\%$ is equal to

(a) $\frac{19}{20}$ *(b)* $\frac{21}{25}$ *(c)* $\frac{91}{200}$ *(d)* $\frac{39}{40}$

Q.3- $\frac{7}{5}$ is equal to

(a) $1\frac{2}{5}$ *(b)* 140 % *(c)* 1.40 *(d)* All of these

Q.4- 71 % of earth is water and the land is

(a) 35 % *(b)* 40 % *(c)* 29 % *(d)* 31 %

Q.5- 0.065 is equal to

(a) 65 % *(b)* $6\frac{1}{2}$ % *(c)* 650 % *(d)* 065 %

Q.6- 56 % of homes have a car then the homes having no cars are.

(a) 34 % *(b)* 44 % *(c)* 54 % *(d)* 60 %

Q.7- 8.4 % of a book consists of 42 pages.
The total number of pages are.

(a) 300 *(b)* 400 *(c)* 500 *(d)* 600

Q.8- 40 books are increased in the ratio
5 : 4 The new number of books are

(a) 32 *(b)* 45 *(c)* 50 *(d)* 52

Q.9- The ratio 1500 : 1200 in its lowest terms is

(a) 15 : 12 *(b)* 1.5 : 1.2 *(c)* 5 : 4 *(d)* 3 : 4

Q.10- Out of 1029 students 504 are girls. The ratio of boys to number of girls is

(a) $1029:504$ *(b)* $504:1029$ *(c)* $504:525$ *(d)* $525:504$

Q.11- If a : b = 2 : 3 then 6a : 2b is equal to

(a) $2:1$ *(b)* $1:2$ *(c)* $3:1$ *(d)* $1:3$

Q.12- If a : b : : c : d then

(a) $ab=cd$ *(b)* $ac=bd$ *(c)* $ad=bc$ *(d)* $\frac{a}{c}=\frac{d}{b}$

Q.13- If x : 3 : : 60 : 15 then x is equal to

(a) 10 *(b)* 12 *(c)* 15 *(d)* 20

Q.14- The relationship between two or more proportions is called

(a) Direct Proportion *(b)* Inverse Proportion

(c) Simple Proportion *(d)* Compound Proportions

Q.15- In a factory , the Proportion between workers and the Production is,

(a) Direct *(b)* Inverse *(c)* Compound *(d)* Complex

Q.16- The proportion between workers and days to complete a work is

(a) Direct *(b)* Inverse *(c)* Compound *(d)* Simple

Q.17- 8 Workers complete a work in 5 days then 4 workers will complete it in

(a) *10* Days *(b)* *12* Days *(c)* *14* Days *(d)* *15* Days

Q.18- Ahmad saves 15 % of his income his expenditure is _________ of income.

(a) 75% *(b)* 80% *(c)* 85% *(d)* 905%

Q.19- Lowest form of 7.5 : 9.5 is

(a) $15:17$ *(b)* $15:19$ *(c)* $19:15$ *(d)* $17:15$

MODEL CLASS TEST

Time : *40* mins Max Marks : *25*

Q.1- Encircle the correct answer.

(i) $\frac{7}{5}$ is equal to

(a) *14%* *(b)* *60%* *(c)* *120%* *(d)* *140%*

(ii) Out of 40 students in a class 30 are Presents. The absent students are

(a) *10%* *(b)* *20%* *(c)* *25%* *(d)* *30%*

(iii) A team won *62%* matches, ended *26%* matches in a draw. The team lost matches

(a) *12%* *(b)* *10%* *(c)* *16%* *(d)* *20%*

(iv) The ratio of *8* rupees each to *72* rupees per dozen is

(a) $4:3$ *(b)* $3:4$ *(c)* $8:5$ *(d)* $1:9$

(v) One angle of a triangle is *60°*. The ratio of this angle to the sum of other two angles is

(a) $1:6$ *(b)* $1:4$ *(c)* $1:3$ *(d)* $1:2$

(vi) The relationship between two or more Proportions is known as

(a) Direct Proportion *(b)* Indirect Proportion

(c) Inverse Proportion *(d)* Compound Proportion

(vii) If $20 : 50 :: 8 : x$ Then

(a) $x = 10$ *(b)* $x = 20$ *(c)* $x = 30$ *(d)* $x = 40$

Q.2- Attempt any 5 short questions from the following.

(i) A table costs Rs. *720*. It is sold for Rs. *920*. What Percentage of profit is earned?

(ii) Define "Antecedent and Consequent" in a ratio.

(iii) In what ratio $60m^2$ be decreased to $24m^2$?

(iv) A rectangle has length of *6cm* and width of *4cm*. A second rectangle has area of $18m^2$. Find the ratio of

between their areas.

(v) Define direct and inverse Proportions?

(vi) A journey takes 5 hours at the speed of $45km/h$. At what speed the journey be completed in 3 hours.

(vii) The price of 15 suits is Rs. 6750. How many such suits can be purchased by an amount of Rs. 4050 ?

Q.3- Attempt any two of the following (4×2)

(i) 8 Persons can do a job in 24 days
If 4 more persons joined them, how many days will they take to complete the same job?

(ii) Azeem spends 25% of his income on house rent, 60% of the remaining on house hold expenditures. If he saves Rs. 2100, what is his total income?

(iii) Rs. 4000 are sufficient for a family of 4 members for 40 days. For how many days Rs. 15000 will be sufficient for a family of 5 members.

◆

UNIT 2 ZAKAT, USHR AND INHERITANCE

SHORT QUESTIONS

Q.1- Define Zakat.

Ans. Zakat is one of the five Pillars of Islam. It is the amount which wealthy Muslim pay to the poors and needy. The rate of Zakat is 2.5% or $\frac{1}{40}$ of the total value of the goods or cash amount.

Q.2- What is Nisab and who is Sahib-e-Nisab?

Ans. 7.5 tola $(86.1262\ gm)$ gold or 52.5 tola $(603\ gm)$ silver or cash amount equivalent to the value of this quantity of gold or silver is called Nisab and the Muslim who keeps one of these things for one year is called Sahib-e-Nisab.

Q.3- Who is to pay Zukat?

Ans. Only Sahib-e-Nisab Muslim is required to pay 2.5% or $\frac{1}{40}$ of his wealth to the poors and the needy.

Q.4- Differentiate exposed and unexposed wealth.

Ans. Agricultural goods, Camels, Sheep goats, Minerals, Business inventories etc are exposed wealth. Whereas Gold, Silver Cash amount, liquid assets etc are unexposed wealth.

Q.5- What types of goods are exempted from Zakat?

Ans. Capital goods like machinery equipments, raw material, factory building etc are exempted from Zakat.

Q.6- Calculate the amount of Zakat on an amount of Rs.5,00,000.

Solution. Amount = 5,00,000

Zakat = 2.5% of Amount

$$= \frac{2.5}{100} \times 5,00,000$$

$$= \frac{1}{40} \times 500000$$

$$= Rs.12500 \text{ Ans.}$$

Q.7- What do you know about Ushr?

Ans. A Land keeping person pays *10%* from agricultural products if the land is irrigated by natural means. He is required to pay *5%* of products, he is required to pay 10% fo products. If land is irrigated by artificial sources. This payment to the poors and needy is called Ushr.

Q.8- A land produce wheat by natural resources. The price of produce is Rs. 9,50,000. Find the amount of Ushr.

Solution: Ushr = *10%* of products

$$= 10\% \text{ of Rs.}950000$$

$$= \frac{10}{100} \times 950000$$

$$= Rs.95000 \text{ Ans.}$$

Q.9- Rice of Rs.150000 is produced by artificial resources in a land. Find the amount of Ushr.

Solution: For artificial resources.

Ushr = *5%* of products

$$= \frac{5}{100} \times 150000 = 7500$$

$$= Rs.7500 \text{ Ans.}$$

Q.10- What do you know about inheritance?

Ans. After the death of a person, the assets left by him are called inheritance. It is distributed among the legal heirs according to the Principle of Islam.

Q.11- What should be done before distribution of inheritance among heirs?

Ans. Before the distribution of it, the following three payments should be paid.

(i) Payment of funeral expenses.

(ii) Payment of debts of deceased.

(iii) Execution of his/her will.

Q.12- What is the share of a widow in inheritance if her husband dies?

Ans. If the husband is issueless, the widow will get $\frac{1}{4}$ of the inheritance, if the husband has children, the widows share is $\frac{1}{8}$ of the wealth.

Q.13- How is the inheritance distributed between sons and daughters.

Ans. A son gets a share equal to that of two daughters.

Q.14- What is the share of husband incase his wife dies?

Ans. He will get one half of the inheritance.

Q.15- A person, having no child, died and left an amount of Rs. 30,00,000. What is the share of his wife?

Solution: As the deceased person was childless. So

$$\text{Share of Widow} = \frac{1}{4} \text{ of Inheritance}$$

$$= \frac{1}{4} \times 30,00000$$

$$= \text{Rs.}750,000 \text{ Ans.}$$

SOLVED EXERCISES

EXERCISE 2.1

Q.1- Calculate Zakat on gold amounting to Rs.11,10,000.

Solution:-

The amount = Rs.$11,10,00$

Zakat = Rs.$2.5\ \%$ of amount

$$=\frac{2.5}{100}\times 11,10,000$$

$$=\frac{1}{4\cancel{0}}\times 11,10,00\cancel{0}$$

= Rs.27750 Ans.

Q.2- Calculate Zakat on silver amounting to Rs.3,00,000.

Solution:-

The amount = Rs.$3,00,000$

Zakat = 2.5% of amount

$$=\frac{2.5}{100}\times 300000$$

$$=\frac{25}{\cancel{1000}}\times 300\cancel{000}$$

= Rs.7500 Ans.

Q.3- Calculate the amount of Zakat on 10 tola gold and 40 tola silver, if the rate of gold is Rs 40,000, per tola and the rate of silver is Rs. 5000 per tola.

Solution:-

Price of gold = $40,000\times 10$ = Rs.$400,000$

Price of silver = 40×5000 = Rs.$200,000$

Total Amount = Rs.$400,000$ + Rs.$200,000$

= Rs.$600,000$

Zakat = 2.5% of amount

$$= \frac{2.5}{100} \times 600000$$

$= \text{Rs.}15000$ Ans.

Q.4- Calculate Zakat on gold of worth Rs. 8,00,000, cash of amount Rs. 4,00,000 and silver of weight 50 tola (Rs. 5000 per tola)

Solution:-

Worth of gold $= \text{Rs.}800,000$

Cash amount $=$ Rs.400,000

Worth of silver $= 50 \times 5000 \quad = \text{Rs.}250,000$

Total Worth $= \text{Rs.}800,000 + \text{Rs.}400,000 + \text{Rs.}250,000$

$= \text{Rs.}1450,000$

Zakat $= 2.5\%$ of Worth

$$= \frac{2.5}{100} \times 1450000$$

$= \text{Rs.}36250$ Ans.

Q.5- Calculate Ushr on a rice crop produced by natural resources amounting to Rs. 6,00,000.

Solution:-

Total amount $= \text{Rs.}600,000$

Ushr for natural resources is 10% of Production. Thus

Ushr $= 10\%$ of $\text{Rs.}600,000.$

$$= \frac{10}{100} \times 600000$$

$=$ Rs.60000 Ans.

Q.6- Calculate Ushr on a wheat crop amounting to Rs. 3,50,000 produced by artificial resources.

Solution:-

Amount of wheat crop $= \text{Rs.}3,50,000$

For artificial resources. ushr is

5% of Production. So

Ushr $= 5\%$ of Rs. $350,000$

$= \frac{5}{100} \times 350000$

$=$ Rs. 17500 Ans.

Q.7- Work out the share of each, if the inherited property amounting to Rs 7,50,000 is left by a deceased, who also left a widow, two son's and one daughter.

Solution:-

(i) Amount of inheritance = Rs. $750,000$

share of widow $= \frac{1}{8} \times 750,000 =$ Rs. 93750

(ii) Remaining amount that is to be distributed among *2* sons and *1* daughter

$=$ Rs $750000 -$ Rs $93750 =$ Rs. 656250

(iii) Ratio of shares

Two sons One daughter

$2 : 2 : 1$

Sum of ratios $= 2+2+1 = 5$

Share of each son $= \frac{2}{5} \times 656250$

$= 2 \times 131250 =$ Rs. 262500

Share of daughter $= \frac{1}{5} \times 656250 =$ Rs. 131250

Q.8- An amount of Rs. 4,00,000 left as an inheritance is to be distributed among a widow and four daughters. Workout the share of each.

Solution:- Inheritance $= 400000$

Widow's share is $\frac{1}{8}$ of the inheritance. So

Widow's share $= \frac{1}{8} \times 400000 = \text{Rs.}50000$ Ans.

Remaining amount that is to be distributed among 4 daughters.

$= \text{Rs } 400000 - \text{Rs } 50000$

$= \text{Rs } 350000$

Share of each daughter $= \frac{1}{4} \times 350000 = 87500$

$= \text{Rs.}87500$ Ans.

Q.9- If a deceased left a property of worth Rs. 1500,000, workout the property, if the left behind a widow

Solution:-

Worth of Property = Rs.15,00,000

As there is no child. So

Widows share $= \frac{1}{4}$ of Property

$= \frac{1}{4} \times 1500{,}000 = \text{Rs.}375000$ Ans.

Q.10- The inherited property amounting to Rs. 20,00,000 is left by a deceased. He left behind a widow and two son-s. Workout the share of each.

Solution:-

Total Amount = 20,00,000

(i) Widow's share $= \frac{1}{8}$ of Property

$= \frac{1}{8} \times 20{,}00000 = \text{Rs.}250000$ Ans.

(ii) Remaining Amount to be distributed between two sons $= \text{Rs } 2000000 - \text{Rs } 250000$

$= \text{Rs.}1750000$

Share of each son $= \frac{1750000}{2} = \text{Rs.}875000$ Ans.

Q.11- Asghar left property of worth Rs.4,80,000 he left behind a widow, three sons and four daughters. Calculate the share of each one.

Solution:-

Worth of Property = Rs.$4,80,000$

Widows share $= \frac{1}{8} \times 480000$

$=$ Rs.875000 Ans.

The amount to be distributed among sons and daughter.

$= 480,000 - 60,000$

$=$ Rs.$420,000$

Ratio:-

Three sons Four daughters

$2 : 2 : 2 : \ 1 : 1 : 1 : 1 :$

Sum of ratios $= 2+2+2+1+1+1+1+1 \quad = 10$

(ii) Share of each son $= \frac{2}{10} \times 420,000$

$=$ Rs.84000 Ans.

(iii) Share of each daughter $= \frac{1}{10} \times 420,000 =$ Rs.42000 Ans.

Q.12- Najeeb left a wealth amounting to Rs. 4,00,000. He left behind a widow, while they did not have any child. Find the share of Najeeb's widow.

Solution:-

Wealth left by Najeeb = Rs.$4,00,000$

As there was not child. So

Widow's share $= \frac{1}{4}$ of wealth

$= \frac{1}{4} \times 400000 =$ Rs $100,000$ Ans.

Review Exercise 2

Q.1- Encircle the correct answer

(i) Zakat is deducted at the rate of

(a) 2.5 % *(b)* 3.5 %

(c) 4.5 % *(d)* 5.5 %

(ii) On a crop produced on natural resources, Ushr is deducted at a rate of:

(a) 2.5 % *(b)* 5 %

(c) 10 % *(d)* 20 %

(iii) On a crop produced on artificial resources Ushr is deducted at rate of

(a) 5 % *(b)* 10 %

(c) 2.5 % *(d)* 25 %

(iv) Zakat on an amount of Rs.100,000 is:

(a) 2500 *(b)* 25000

(c) 2000 *(d)* 15000

(v) Ushr on a wheat crop produced on natural resources amounting Rs.1,50,000 is:

(a) 10,000 *(b)* 5000

(c) 15000 *(d)* 20000

(vi) The share of a childless widow in inherited property is:

(a) $\frac{1}{4}$ *(b)* $\frac{1}{8}$

(c) $\frac{1}{2}$ *(d)* $\frac{1}{2}$

(vii) The share of widow in the presence of a child or agnatic grand child is:

(a) $\frac{1}{4}$ *(b)* $\frac{1}{8}$

(c) $\frac{1}{2}$ *(d)* $\frac{1}{6}$

(viii) If there is only a single daughter or an agnatic grand daughter, her share is fixed:

(a) $\frac{1}{4}$ (b) $\frac{1}{6}$

(c) $\frac{1}{2}$ (d) $\frac{1}{8}$

(ix) If there are two or more than two daughters or agnatic grand daughter then their share is:

(a) $\frac{2}{3}$ (b) $\frac{1}{4}$

(c) $\frac{1}{2}$ (d) $\frac{1}{8}$

(ix) If there is one daughter and agnatic grand-daughters, their share are respectively:

(a) $\frac{1}{2},\frac{1}{6}$ (b) $\frac{1}{2},\frac{1}{3}$

(c) $\frac{1}{2},\frac{1}{4}$ (d) $\frac{1}{2},\frac{1}{8}$

Ans:

(i) a	*(ii)* c	*(iii)* a	*(iv)* a
(v) c	*(vi)* a	*(vii)* b	*(viii)* c
(ix) a	*(x)* a		

Q.2- Fill in the blanks.

(i) Zakat is deducted at a rate of____________

(ii) On a crop produced on natural resources Ushr is deducted at a rate of____________

(iii) On a crop produced on artificial resources Ushr is deducted at a rate of ____________

(iv) Zakat on an amount of Rs.*2,00,000* is ____________

(v) Ushr at a rate of 10% on amount of Rs.1,00,000 is___

(vi) In an inherited property the share of a widow is ______

(vii) In an inherited property the share of a widow in case of no child is ______

(viii) If there is only a single daughter then share in inherited property is ______

(ix) The share of son and daughter in an inherited property is in the ratio ______

(x) If there are two or more than two daughters, then their share in an inherited property is ______

Ans:

(i) 2.5 %	(ii) 10 %	(iii) 5 %
(iv) Rs.5000	(v) Rs.10,000	(vi) $\frac{1}{8}$ of property
(vii) $\frac{1}{4}$ of property	(viii) $\frac{1}{2}$ of property	(ix) 2 : 1
(x) $\frac{2}{3}$ of property		

Q.3- Calculate Zakat on gold amounting Rs.15,00,000

Solution:-

Value of gold = Rs.15,00,000

Zakat = 2.5% of value

$$= \frac{2.5}{100} \times 1500,000$$

$$= 25 \times 1500 = \text{Rs.}37500$$

Q.4- Calculate Ushr on a rice crop amounting Rs.4,90,000 produced by artificial resources.

Solution:-

Amount of rice crop Rs.490,000

As the production is by artificial means.

So,

Usher = 5% of production

$= \frac{5}{\cancel{100}} \times 4900\cancel{00}$

= Rs.24500 Ans.

Q.5- A deceased left a property of worth Rs.45,00,000. If he left behind a widow and two sons, work out the share of each.

Solution:-

Property worth = Rs.45,00,000

(i) Share of widow $= \frac{1}{8} \times 45,00,000$

= Rs.562500 Ans.

Remaining amount that is to be distributed between two

sons.

= Rs.45,00,000 – Rs.562500

= Rs.3937500

(ii) Share of each son $= \frac{1}{2} \times 3937500$

= Rs.1968750 Ans.

Q.6- Akram left a property of worth Rs.48,00,000. He left behind a window; three sons and four daughters. Calculate the share of each.

Solution:-

Value of property = Rs.48,00,000

(i) Share of widow $= \frac{1}{8} \times 48,00,000$

= Rs.6,00,000 Ans.

Remaining amount that is to be distributed among sons and daughters

= Rs.48,00,000.– Rs.6,00,000 = Rs.42,00,000

Ratio :-

Three sons Four daughters

2 : 2 : 2 : 1 : 1 : 1 : 1 :

Sum of ratios $= 2+2+2+1+1+1+1+1 = 10$

(ii) Share of each son $= \frac{2}{10} \times 420{,}000$

= Rs.84000 Ans.

(iii) Share of each daughter $= \frac{1}{10} \times 420{,}000$

= Rs.42000 Ans.

MULTIPLE CHOICE QUESTIONS

Q.(1) Chose the best of given answers

(i) The basic pillars of Islam are

(a) Two *(b)* Three

(c) Four *(d)* Five

(ii) Nisab for Zakat is

(a) 7.5 tola of gold *(b)* 52.5 tola of silver

(c) Cash value of 7.5 tola of gold or 52.5 tola of silver

(d) Any one of these three.

(iii) Zakat is paid from

(a) Exposed wealth *(b)* Un Exposed wealth

(c) Both of these *(d)* Any one of these

(iv) Usher from the land which is irrigated by tube wells is

(a) 2.5% *(b)* 5%

(c) 10% *(d)* $\frac{1}{40}$

(v) The assets left by a deceased person is called.

(a) Property *(b)* Wealth

(c) Inheritance *(d)* Amount

(vi) A man died and left two daughters and a grand daughter. The grand daughter would share

(a) $\frac{1}{6}$ of inheritance *(b)* $\frac{1}{2}$ of inheritance

(c) Zero *(d)* $\frac{2}{3}$ of inheritance

(vii) If there is one daughter and grand a daughter then share of grand daughter is

(a) $\frac{1}{6}$ *(b)* $\frac{1}{2}$

(c) Zero *(d)* $\frac{2}{3}$

(viii) In case, the wife dies the share of husband in her property is

(a) $\frac{1}{2}$ *(b)* $\frac{1}{4}$

(c) $\frac{1}{8}$ *(d)* $\frac{2}{3}$

(ix) How many duties are performed when a Muslim dies

(a) Two *(b)* Three

(c) Four *(d)* Five

(x) Zakat on amount of Rs. *10,00,000* is

(a) Rs. *10,000* *(b)* Rs. *20000*

(c) Rs. *25000* *(d)* Rs. *30,000*

MODEL CLASS TEST

Time : *40* mins Max Marks : *25*

Q.(1) Encircle the corrcet answer.

(i) Zakat is paid for

(a) Exposed wealth *(b)* Un Exposed wealth

(c) Exposed and un exposed wealth *(d)* Cash Money

(ii) Which one is exempted from Zakat

(a) Cash Money *(b)* Gold

(c) Liquid assets *(d)* Capital Goods

(iii) The crop is produced by natural resources. Its amount is Rs. *150,000*. The ushr of this crop is

(a) Rs. *7500* *(b)* Rs. *3750*

(c) Rs. *15000* *(d)* Rs. *30,000*

(iv) The share of a childless widow in the property of Rs.*100,000* is.

(a) Rs. *50,000* *(b)* Rs: *25000*

(c) Rs. *12500* *(d)* Rs. *16666*

(v) Wife of a person died and left inheritance amounting Rs. *5,00,000* the share of that person is.

(a) Rs. *10,000* *(b)* Rs. *25000*

(c) Rs. *250000* *(d)* Rs. *62500*

(vi) Zakat on Gold amounting to Rs. 11,10,000 is

(a) Rs. *27750* *(b)* Rs. *55500*

(c) Rs. *11100* *(d)* Rs. *72750*

(vii) The assets left by a deceased person is called

(a) Wealth *(b)* Property

(c) Inheritance *(d)* Amount

Answers:	a	b	c	d
(i)	○	○	○	○
(ii)	○	○	○	○
(iii)	○	○	○	○
(vi)	○	○	○	○
(v)	○	○	○	○
(vii)	○	○	○	○
(viii)	○	○	○	○

Q.(2) Attempt any five of the following short question

(i) What do you know about ushr on two kinds of lends.

(ii) Who is required to pay Zakat ?

(iii) Calculate Zakat on an amount of Rs. 5,00,000.

(iv) What kind of payment are paid before distributions of inheritance.

(v) Find the share of issueless widow in the property of Rs. 30,00,000.

(vi) Calculate ushr on a Crop Produced by natural resources amounting Rs. 600,000.

(vii) Calculate ushr on a Corp amounting to Rs. 350,000. Produced by artificial resources.

Part II

Solve any Two of the following questions.

(3) Calculate Zakat on cash amount of Rs.300,000 gold of weight 40 gm and silver 500 gm. The rate of gold is Rs.3500 per gm and that of silver is Rs.400 per gm.

(4) If wheat Crop is produced 40000 kg by natural resources and the price of wheat is Rs. 950 per 40 kg. Find the amount of Ushr.

(5) Asghar left a property of worth Rs. 480000. He left behind a widow three sons and four daughters. Find the share of each one.

* * *

UNIT 3 BUSINESS MATHEMATICS

SHORT QUESTIONS

Q.1- Define Profit and Percentage of Profit.

Ans. If selling price of an article is greater than the cost price. Then the difference between them is called profit. Thus

Profit = Selling Price – Cost Price

$\Rightarrow P = SP - CP \Rightarrow S.P = C.P + P.$

$$\text{Profit Percentage} = \frac{Profit}{C.P} \times 100\%$$

Q.2- Define Loss and Loss percentage?

Ans. When the selling price is less than its cost price. Then the difference between them is called loss. Thus.

Loss = Cost Price – Selling Price

Loss = C.P – S.P ⇒ C.P = S.P + Loss.

$$\text{Loss}\,\%\,age = \frac{Loss}{C.P} \times 100\%$$

Q.3- Define Marked Price, List Price and Discount.

Ans. The price printed on the wrapper of article is called marked price and the price of article given in the list provided by the factory is called list price.

A deduction of price offered by the seller on the marked price or the list price is called discount.

Q.4- Write the mathematical relations regarding discount.

Ans.

(i) Discount = (Marked price or List Price) × Discount %

(ii) Sale Price = (Marked or List Price) − Discount

(iii) $\text{Discount \%} = \frac{\text{Discount}}{\text{M.P}} \times 100$

Q.5- Define Partnership. What are its types.

Ans. An association of two or more persons who runs a business to get profit is called partnership. There are two type of partnership.

(i) Simple partnership. (ii) Compound partnership.

Q.6- Define simple partnership.

Ans. When the partners invest capital for the same period of time the partnership is called simple. In this case, profit or loss is distributed among partners in the ratio of capital invested by each of them.

Q.7- Define compound partnership.

Ans. When different partners invest capital for different periods of time, the partnership is known as compound. In this case, profit and loss is distributed in the ratio of products of capital and period of investment of each partner.

Q.8- A bicycle was purchased for Rs.3450 and sold for Rs.3850. Find the profit percentage.

Solution. C.P = Rs.3450, S.P = Rs.3850

Profit = Rs.3850 − Rs.3450 = Rs.400

$$\text{Profit \% age} = \frac{\text{Profit}}{\text{Cost.P}} \times 100 = \frac{400}{3450} \times 100$$

$$= 11.6\%$$

Q.9- A book is sold for Rs.650 at a profit of 30%. Find the cost price.

Solution. S.P = Rs.650

Profit % age = 30 %

$$\text{C.P} = \frac{100}{100 + \text{Profit \% age}} \times \text{S.P}$$

$$= \frac{100}{100+30} \times 650 = \text{Rs. } 500 \text{ Ans.}$$

Q.10- A boy bought a book for Rs.575 and sold it for Rs.320 what was the loss % age.

Solution. C.P = Rs.575, S.P = Rs.320

Loss = Rs.575 – Rs.320 = Rs. 255

$$\text{Loss \% age} = \frac{\text{Loss}}{\text{C.P}} \times 100$$

$$= \frac{255}{575} \times 100 = 44.34\%$$

Q.11- Marked price of dinner set is Rs.8450. The store offers 10% discount what is the sale price of dinner set ?

Solution. M.P = Rs.8450

Discount = 10% of M.P.

$$= \frac{10}{100} \times 8450 = \text{Rs.}845$$

Sale Price = M.P – Discount

= Rs.8450 – Rs.845 = Rs.7605

Q.12- The share of three partners are in the ratio 2:3:5. Find the share of each in the loss of Rs.10,00,000.

Solution. Given Ratio = 2 : 3 : 5

Sum of ratios = 2 + 3 + 5 = 10

$$\text{Share of 1st partner} = \frac{2}{10} \times 1000000 = \text{Rs.}200000$$

$$\text{Share of 2nd partner} = \frac{3}{10} \times 10,00,000 = \text{Rs.}30,00.00$$

$$\text{Share of 3rd partner} = \frac{5}{10} \times 10,00000 = \text{Rs.}500,000$$

Q.13- Umer and Ali invested Rs.3,00,000 and Rs.5,00,000 respectively and earned a profit of 2,20,000 from a business. Find the share of each in profit.

Solution. Ratio : Umer : Ali

3,00,000 : 5,00,000

3 : 5

Sum of ratios $= 3 + 5 = 8$

Profit = Rs.2,20,000

$$\text{Umer's share} = \frac{3}{8} \times 22,0000 = \text{Rs.}82,500 \text{ Ans.}$$

$$\text{Ali's share} = \frac{5}{8} \times 220,000 = \text{Rs.}1,37,500 \text{ Ans.}$$

SOLVED EXERCISES

EXERCISE 3.1

Q.1- Find the SP, when

(i) **CP = Rs.950, Profit = 10%**

(ii) **CP = Rs.1540, Loss = 5%**

(iii) **CP = Rs.9600, Profit = 10%**

(iv) **CP = Rs.126000, Loss = 5%**

(v) **CP = Rs.480, Profit = 3%**

(vi) **CP = Rs.760, Loss = 4%**

Solution:-

(i) C.P = Rs.950, Profit = 10%

Profit = 10% of C.P

$$= \frac{10}{100} \times 950 = Rs.95$$

S.P = C.P + Profit

= Rs.950 + Rs.95 = Rs.1045 Ans.

(ii) C.P = Rs.1540; Loss = 5%

Loss = 5% of C.P

$$= \frac{5}{100} \times 1540 = Rs.77$$

S.P = C.P – Loss

= Rs.1540 – Rs.77 = Rs.1463 Ans.

(iii) C.P = Rs.9600, Profit = 10%

Profit = 10% of C.P

$$= \frac{10}{100} \times 9600 = Rs.960$$

S.P = C.P + Profit

= 9600 +960 = Rs.10560 Ans.

(iv) C.P = Rs.126000, Loss = 5%

Loss = 5% of C.P

$$= \frac{5}{1\cancel{00}} \times 1260\cancel{00} = Rs.6300$$

S.P = C.P – Loss

= Rs.126000 – Rs.6300 = Rs.119700 Ans.

(v) C.P = Rs.480, Profit = 3%

Profit = 3% of C.P

$$= \frac{3}{100} \times 480$$

= Rs.14.40

S.P = C.P + Profit

= Rs.480 + Rs.14.40 = Rs.494.40 Ans.

(vi) C.P = Rs.760, Loss = 4%

Loss = 4% of C.P

$$= \frac{4}{100} \times 760 = Rs.30.40$$

S.P = C.P – Loss

= Rs.760 – Rs.30.40 = Rs.729.60 Ans.

Q.2- Haris purchased a car for Rs.248000 and spent Rs.12000 on its denting and painting. He sold that at a profit of 5%. What did the customer pay to Haris?

Solution:-

Cost Price = Amount for Purchasing
+ Amount for denting and Painting

$$\therefore \text{C.P} = \text{Rs.}248000 + \text{Rs.}12000$$

$$= \text{Rs.}260000$$

$$\text{Profit} = 5\% \; of \; \text{C.P.}$$

$$= \frac{5}{\cancel{100}} \times 2600\cancel{00} = Rs.13000$$

$$\text{S.P} = \text{C.P} + \text{Profit} = \text{Rs.}260000 + \text{Rs.}13000$$

$$= \text{Rs.}273000$$

Thus the customer paid Rs.*273000* to Haris. Ans.

Q.3- Find the CP, when

(i) **SP = Rs.672, Profit = 5%**

(ii) **SP = Rs. 851, Loss = 8%**

(iii) **SP = Rs.1755, Profit = $12\frac{1}{2}$%**

(iv) **SP = Rs. 2640, Loss = 12%**

(v) **SP = Rs.100, Profit = $33\frac{1}{2}$%**

Solution:-

(i) S.P = Rs.*672*, Profit = *5%*

$$\text{C.P} = \frac{100}{100 + \text{Profit \% age}} \times \text{S.P}$$

$$= \frac{100}{100 + 5} \times 672$$

$$= \frac{67200}{105} = \frac{13440}{21} = 640$$

C.P = Rs.*640* Ans.

(ii) S.P = Rs.851, Loss = 8%

$$\text{C.P} = \frac{100}{100 - \text{Loss \% age}} \times \text{S.P}$$

$$= \frac{100}{100 - 8} \times 851$$

$$= \frac{\overset{25}{\cancel{100}}}{\underset{4}{\cancel{92}}} \times \overset{37}{\cancel{851}} = \text{Rs.}925 \text{ Ans.}$$

(iii) $SP = Rs.1755, Profit = 12\frac{1}{2}\% = 12.50\%$

$$\text{C.P} = \frac{100}{100 + \text{Profit \% age}} \times \text{S.P}$$

$$= \frac{100}{100 + 12.50} \times 1755 = \frac{175500}{112.50}$$

$$= \text{Rs.}1560 \text{ Ans..}$$

(iv) S.P = Rs.2640, Loss = 12%

$$\text{C.P} = \frac{100}{100 - \text{Loss \% age}} \times \text{S.P}$$

$$= \frac{100}{100 - 12} \times 2640$$

$$= \frac{100}{\cancel{88}} \times \overset{30}{\cancel{2640}} = \text{Rs.}3000$$

$\therefore$ C.P = Rs.3000 Ans.

(v) S.P = Rs.100, Profit = 33.5%

$$\text{C.P} = \frac{100}{100 + \text{Profit \% age}} \times \text{S.P}$$

$$= \frac{100}{100 + 33.5} \times 100 = \frac{10000}{133.5} = \text{Rs.}75 \text{ Ans.}$$

Q.4- A shop-keeper gains a profit of 7% by selling a dinner set for Rs.3852. If he sells it for Rs.4050, find his profit percentage.

Solution:-

S.P = Rs.3852, Profit = 7%

$$\text{C.P} = \frac{100}{100 + \text{Profit \% age}} \times \text{S.P}$$

$$= \frac{100}{100+7} \times 3852 \frac{100}{\cancel{102}} \overset{36}{\cancel{385.2}}$$

C.P = Rs.3600

Now again

C.P = Rs.3600 and S.P = Rs.4050

Profit = S.P − C.P

= Rs.4050 − Rs.3600 = Rs.450

$$\text{Profit \% age} = \frac{\text{Profit}}{\text{C.P}} \times 100$$

$$= \frac{450}{36\cancel{00}} \times 1\cancel{00} = \frac{50}{4}$$

$$= 12.5\% = 12\frac{1}{2}\% \text{ Ans.}$$

Q.5- The selling price of 12 articles is equal to the cost price of 15 articles. Find profit percentage.

Solution:-

Let cost price of 15 articles = Rs.100

So sale price of 12 articles = Rs.100

and sale price of 15 articles $= \frac{100}{12} \times 15$ = Rs.125

So Profit = S.P − C.P = Rs.125 − Rs.100 = 25

$$\text{Profit \% age} = \frac{\text{Profit}}{\text{C.P}} \times 100$$

$$= \frac{25}{100} \times 100 = 25\% \text{ Ans.}$$

Q.6- Find the cost price, if a fan is sold for Rs.1470, to get a profit $\frac{1}{6}$ the of its cost price.

Solution:-

Selling price = Rs.1470

$$\text{Profit} = \frac{1}{6} \text{ of C.P.}$$

Thus.

$$\text{S.P} = \text{C.P} + \text{Profit}$$

$$\text{S.P} = \text{C.P} + \frac{1}{6}(\text{C.P})$$

$$\text{S.P} = \left(1 + \frac{1}{6}\right) \times \text{C.P}$$

$$= \frac{7}{6}\text{C.P}$$

$$\text{C.P} = \frac{6}{7}.\text{S.P}$$

$$= \frac{6}{7} \times (1470) = \text{Rs.}1260 \text{ Ans.}$$

Q.7- A man sold an almirah at a profit of $7\frac{1}{2}\%$, had he sold it for Rs.209, he would have lost 2%. For how much the man purchased it?

Solution:-

S.P = Rs.209

Loss = $2\ \%$, C.P = ?

$$\text{C.P} = \frac{100}{100 - \text{Loss\%age}} \times \text{S.P}$$

$$= \frac{100}{100 - 2} \times 209 = \frac{100}{98} \times 209 = \text{Rs.}213 \text{ Ans.}$$

Q.8- Three chairs are purchased at Rs.450 each. One of these is sold at a loss of 10%. At what price should the other two be sold so as to gain 20% on the whole transaction?

Solution:-

C.P of each chairs = Rs.450

For $1st$ chair

Loss = 10% = 10% of C.P

$$= \frac{10}{100} \times 450 = \text{Rs.}45$$

S.P = C.P − Loss = Rs.450 − Rs.45

S.P = Rs.405

For the whole transaction.

Profit = 20%

$= 20\%$ of C.P

$$= \frac{20}{100} \times 1350 = \text{Rs.}270$$

S.P of the three chairs

= C.P + Profit $= 1350 + 270 =$ Rs.1620

S.P of other two chairs = S.P of three chairs
− S.P of 1st chair

= Rs.1620 − Rs.405 = Rs.1215 Ans.

EXERCISE 3.2

Q.1- Find the selling price, when

- ***(i)*** **MP = Rs.728, Discount = 6%**
- ***(ii)*** **MP = Rs.2760, Discount = 5%**
- ***(iii)*** **MP = Rs.395.75, Discount = 8%**

Solution:-

(i) M.P = Rs.728, Disc = 6%

Disc = 6% of M.P

$$= \frac{6}{100} \times 728 = \text{Rs.}43.68.$$

Thus S.P = M.P – Disc

$= \text{Rs.}728 - \text{Rs.}43.68$

$= \text{Rs.}684.32$ Ans.

(ii) M.P = Rs.*2760,* Disc = *5%*

Disc = *5%* of M.P

$$= \frac{5}{100} \times 2760 = \text{Rs.}138$$

Thus S.P = M.P – Disc

$= \text{Rs.}2760 - \text{Rs.}138$

$= \text{Rs.}2622$ Ans.

(iii) M.P = Rs.*395.75,* Disc = *8%*

Disc = *8%* of M.P

$$= \frac{8}{100} \times 395.75 = 31.66$$

Thus S.P = M.P – Disc = Rs.*395.75* – Rs.*31.66*

$= \text{Rs.}364.08$ Ans.

Q.2- Find the marked price, when

- **(i) SP = Rs.515.20, Discount = 8%**
- **(ii) SP = Rs.858, Discount = 12%**
- **(iii) SP = Rs.2400, Discount = 4%**

Solution:-

(i) S.P = Rs.*515.20,* Disc = *8%*

$$\text{M.P} = \left(\frac{100}{100 - \text{Dice}}\right) \times \text{S.P}$$

$$= \frac{100}{100 - 8} \times 515.20$$

$$= \frac{100}{92} \times 515.20 = \text{Rs.}560 \textit{ Ans.}$$

(ii) S.P = Rs.858, Disc = 12%

$$\text{M.P} = \frac{100}{100 - \text{Dice}} \times \text{S.P}$$

$$= \frac{100}{100 - 12} \times 858$$

$$= \frac{100}{88} \times 858 \quad = \text{Rs.}975 \text{ Ans.}$$

(iii) S.P = Rs.2400, Disc = 4%

$$\text{M.P} = \left(\frac{100}{100 - \text{Dice}}\right) \times \text{S.P}$$

$$= \frac{100}{100 - 4} \times 2400$$

$$= \frac{\overset{25}{\cancel{100}}}{\underset{24}{\cancel{96}}} \times 2400 \quad = \text{Rs. } 2500 \text{ Ans.}$$

Q.3- The marked price of a ceiling fan is Rs.720. It is sold for Rs.684. What percentage discount is being allowed?

Solution:-

M.P = Rs.720, S.P = Rs.684

Disc = M.P – S.P = Rs.720 – Rs.684 = Rs.36

$$\text{Disc \%age} = \frac{\text{Dise}}{\text{M.P}} \times 100$$

$$= \frac{36}{720} \times 100 = 5\% \text{ Ans.}$$

Q.4- The marked price of washing machine is Rs.3640. During sale season it is sold for Rs.3367. What percent sale discount is being given.

Solution:-

M.P = Rs.3640, S.P = Rs.3367

Disc = Rs.3640 – Rs.3367 = Rs.273

$$\text{Disc \% age} = \frac{\text{Dise}}{\text{M.P}} \times 100$$

$$= \frac{273}{364\cancel{0}} \times 10\cancel{0} = \frac{390}{52} = \frac{30}{4} = \text{Rs.}7.5\% \text{ Ans.}$$

Q.5- The marked price of a book is Rs.480. The shopkeeper offers a discount of 10 % and still gains 8%. Find the price at which the shopkeeper purchased it.

Solution:-

$$\text{Disc} = 10\%$$

$$= 10\% \text{ of M.P}$$

$$= \frac{10}{100} \times 48\cancel{0} = \text{Rs.}48$$

$$\text{S.P} = \text{M.P} - \text{Disc}$$

$$= 480 - 48 - \text{Rs.}432$$

Now

$$\text{C.P} = \frac{100}{100 + \text{Profit \% age}} \times \text{S.P}$$

$$= \frac{100}{100+8} \times 432$$

$$= \frac{100}{108} \times 432 = \text{Rs.}400 \text{ Ans.}$$

Q.6- A trader marks his goods in such a way that after allowing a discount of 10%, he gains 15%. If an article costs him Rs.720. What is its, marked price?

Solution:-

$$\text{C.P} = \text{Rs.}720$$

$$\text{Profit} = 15\%$$

$$\text{Profit} = 15\% \text{ of C.P}$$

$$= \frac{15}{100} \times 720$$

$= \text{Rs. } 108$

$S.P = C.P + \text{Profit.}$

$= \text{Rs.}720 + \text{Rs.}108 = \text{Rs.}828$

Now $M.P = \dfrac{100}{100 - \text{Disc \% age}} \times S.P$

$= \dfrac{100}{100 - 10} \times 828$

$= \dfrac{10\cancel{0}}{9\cancel{0}} \times 828 = \text{Rs.}920$ Ans.

Q.7- The list price of a TV is Rs.12600. A discount of 5% is allowed on it. Further for cash payment a second discount of 2% is given. How much cash payment is to be made for buying it?

Solution:-

List Price = Rs.12600

Disc = 5% of L.P

$= \dfrac{5}{100} \times 12600 = \text{Rs.}630$

S.P = L.P − Disc

$= \text{Rs.}12600 - \text{Rs.}630 = \text{Rs.}11970$

Disc for Cash Payment = 2 %

= 2% of Cash

$= \dfrac{2}{10\cancel{0}} \times 1197\cancel{0} = \text{Rs.}239.40$

Cash Price = Rs.11970 − 239.40 = Rs. 11730.60 Ans.

Q.8- If 15 % discount on MP of a heater is allowed and still makes a profit of 2%. if it is sold on MP, what is profit percentage?

Solution:- Let us suppose.

M.P = Rs.100

Disc = 15% = Rs.15

$$S.P = M.P - Disc$$

$$= Rs.100 - Rs.15$$

$$S.P = Rs.85$$

Profit % age = 2%

$$C.P = \frac{100}{100 + \text{Profit \% age}} \times S.P$$

$$= \frac{100}{102} \times 85 = \frac{\overset{500}{\cancel{8500}}}{\underset{6}{\cancel{102}}} = \frac{250}{3}$$

$$C.P = Rs.83.33$$

Now if the heater is sold on Marked price = Rs.100

$$Profit = S.P - C.P$$

$$= 100 - 83.33 = Rs.16.67$$

Thus Profit % age is

$$= \frac{Profit}{C.P} \times 100$$

$$= \frac{\cancel{16.67}}{\cancel{83.33}} \times 100$$

$$= 20\% \text{ Ans.}$$

EXERCISE 3.3

Q.1- Distribute Rs.200,000 as profit in a business regarding three persons, if their shares are in the ratio 3 : 2 : 5.

Solution:-

Let the three persons be named as A, B and C. So

Profit = Rs. $200,000$

Given ratio

$$\begin{array}{ccccc} A & : & B & : & C \\ 3 & : & 2 & : & 5 \end{array}$$

Sum of ratios = $3 + 2 + 5 = 10$

$$\text{A's Share} = \frac{3}{1\cancel{0}} \times 20000\cancel{0} = \text{Rs.}60000 \text{ Ans.}$$

$$\text{B's Share} = \frac{2}{10} \times 200000 = \text{Rs.}40000 \text{ Ans.}$$

$$\text{C's Share} = \frac{5}{10} \times 200000 = \text{Rs.}100000 \text{ Ans.}$$

Q.2- If Ali, Daniyal and Abdullah earned 15% profit against an investment of Rs.750,000. Find the profit of each if their shares are in the ration 2 : 3 : 5.

Solution:-

Investment = Rs. $750,000$

Profit = 15 % of investment

$$= \frac{15}{1\cancel{00}} \times 750,0\cancel{00} = \text{Rs. } 112500$$

Given Ratio :

Ali : Daniyal : Abdullah

$2 : 3 : 5$

Sum of ratios = $2 + 3 + 5 = 10$

$$\text{Ali's Share} = \frac{2}{10} \times 112500 = \text{Rs.}22500 \text{ Ans.}$$

$$\text{Daniyl's Share} = \frac{3}{10} \times 112500 = \text{Rs.}33750 \text{ Ans.}$$

$$\text{Abdullah's Share} = \frac{5}{10} \times 112500 = \text{Rs.}56250 \text{ Ans.}$$

Q.3- Distribute Rs.720 as profit amongst three people, so that their shares are in the ratio 3 : 4 : 5.

Solution:-

Profit = Rs. 720

Given Raito = $3 : 4 : 5$

Sum of ratios = $3 + 4 + 5 = 12$

$$\text{First Share} = \frac{3}{12}\times 720 = \text{Rs.}180 \text{ Ans.}$$

$$\text{2nd Share} = \frac{4}{12}\times 720 = \text{Rs.}240 \text{ Ans.}$$

$$\text{3rd Share} = \frac{5}{12}\times 720 = \text{Rs.}300 \text{ Ans.}$$

Q.4- Three persons invested an amount of Rs.3,000,000 in a business with shares ratio 2 : 3 : 7. They earned a profit of Rs. 600,000. If they are interested to wind up their business, what amount every share holder would get?

Solution:-

Total investment = Rs. $3,000,000$

Given Raito = $2 : 3 : 7$

Sum of ratios = $2 + 3 + 7 = 12$

$$\text{Investment of first partner} = \frac{2}{\cancel{12}}\times \overset{250000}{\cancel{3000000}} = \text{Rs.}500000$$

$$\text{Investment of 2nd partner} = \frac{3}{12}\times 3000000 = \text{Rs.}750000$$

$$\text{Investment of 3rd partner} = \frac{7}{12}\times 3000000 = \text{Rs.}1750000$$

Now

Total Profit = Rs. $600,000$

$$\text{Profit of 1st partner} = \frac{2}{12}\times 600000 = \text{Rs.}100{,}000$$

$$\text{Profit of 2nd partner} = \frac{3}{12}\times 600000 = \text{Rs.}150{,}000$$

$$\text{Profit of 3rd partner} = \frac{7}{12}\times 600000 = \text{Rs.}350{,}000$$

Now Amount of each partner is

Amount of 1st Partner = Investment + Profit

= Rs. *500000* + Rs. *100,000* = Rs. *600,000 Ans.*

Amount of 2nd Partner = Rs. *750000* + Rs. *150,000*

= Rs. *900000* Ans.

Amount of 3rs Partner = Rs. *1750000* + Rs. *350,000*

= Rs. *2100000* Ans.

Q.5- Three member of a firm divide the profit Rs.67,200 among themselves in the ratio 2 : 3 : 7. What is the biggest share of the profit?

Solution:-

Profit = Rs. *67,200*

Given Raito = $2 : 3 : 7$

Sum of ratios = $2 + 3 + 7 = 12$

Biggist Share $= \frac{7}{12} \times \overset{5600}{\cancel{67200}} =$ Rs.*39200* Ans.

Q.6- A sum of money is divided among three persons. A,B and C in the ratio 10 : 7 : 5. If "B" gets Rs. 14 more than "C". How much will "A" get and what is the total sum of money?

Solution:-

As the given Ratio is

A : B : C

$10 : 7 : 5$

So let money of each person be $10x$, $7x$ and $5x$ respectively.

By the given condition.

B's Money – C's Money = Rs. *14*

$$7x - 5x = 14$$

$$2x = 14$$

$$x = 7$$

Thus A's Money $= 10x = 10 \times 7 =$ Rs.70

Total sum of Money $= 10x + 7x + 5x$

$= 22x = 22 \times 7$

$=$ Rs.154 Ans.

Review Exercise-3

Q.1- Encircle the correct answer.

(i) Profit is earned when:

(a) SP = CP *(b)* SP < CP

(c) SP > CP *(d)* none of these

(ii) Loss is there when:

(a) SP = CP *(b)* SP < CP

(c) SP = MP *(d)* SP > CP

(iii) Profit % = ? where SP > CP:

(a) $\frac{Profit}{CP}$ *(b)* $\frac{Profit}{CP} \times 100$

(c) $\frac{CP \times Profit\,\%}{100}$ *(d)* $\frac{100 \times SP}{100 + Profit\,\%}$

(iv) SP = ? where SP > CP:

(a) Profit – CP *(b)* $\left(\frac{100 + Profit\,\%}{100}\right) \times CP$

(c) CP – Loss *(d)* $\frac{CP \times Loss\,\%}{100}$

(v) CP = ? :

(a) $\frac{100 \times SP}{100 + Profit\,\%}$ *(b)* loss – SP

(c) MP + discount *(d)* $\frac{Discount \times 100}{MP}$

Ans.

(i) (c)	*(ii) (b)*	*(iii) (b)*	*(iv) (b)*	*(v) (a)*

Q.2- Fill in the blanks.

(i) The price at which a particular item is purchased is called________.

(ii) The price at which an article is sold out is called ____.

(iii) When $SP > CP$, $CP = SP - ?$________.

(iv) When $SP < CP$, Loss % = ________.

(v) $MP = \frac{100 \times SP}{?}$ ________.

Ans.

(i) Cost Price	*(ii)* Sale Price	*(iii)* Profit
(iv) $\frac{C.P - S.P}{C.P} \times 100$	*(v)* 100 – Disc % age	

Q.3- A shopkeeper gains a profit of 8% by selling a washing machine for Rs.12000. If he sells it for Rs.10,500, find his profit percentage.

Solution:-

$S.P = Rs.12000,$ Profit $= 8\%$

$$C.P = \frac{100}{100 + \text{Profit \% age}} \times S.P$$

$$= \frac{100}{\underset{\underset{9}{\cancel{27}}}{\cancel{108}}} \times \overset{\overset{1000}{\cancel{3000}}}{\cancel{12000}} = \frac{100000}{9} = Rs.11111.11$$

Now if $S.P = Rs.10500$

Now $S.P < C.P$. So loss is incurred.

$$\therefore \text{Loss} = C.P - S.P = 11111.11 - 10500 = Rs.611.11$$

$$\text{Loss \% age} = \frac{\text{Loss}}{C.P} \times 100$$

$$= \frac{611.11}{11111.11} \times 100$$

$$\begin{array}{r} 5.5 \\ 1111\overline{)61111} \\ \underline{55555} \\ 55560 \end{array}$$

$= 5.5\%$ Ans.

Q.4- If there is a 10% discount on marked price of a television and still makes a profit of 5%. If it is sold in marked price, what is profit percentage?

Solution:-

Let us suppose

M.P = Rs.100

Disc = 10 % of M.P

$$= \frac{10}{100} \times 100 = \text{Rs.}10$$

S.P = M.P − Disc = $100 - 10$ = Rs.90

Profit = 5%. So

$$\text{C.P} = \frac{100}{100 + \text{Profit \%age}} \times \text{S.P}$$

$$= \frac{100}{105} \times 90 = \frac{20}{21} \times 90 = \frac{600}{7} = 85.71$$

$\therefore$ C.P = Rs.85.71

Now If T.V is sold on M.P

S.P = Rs.100

Profit = S.P − C.P = Rs.100 − Rs.85.71 = Rs.14.30

$$\text{Profit \%age} = \frac{\text{Profit}}{\text{C.P}} \times 100$$

$$= \frac{14.30}{85.70} \times 100 = \frac{100}{6} = 16.6\% \text{ Ans.}$$

Q.5- Distribute Rs.33,000 as a profit in a business regarding three persons, if their shares are in the ratio 3:5:3.

Solution:-

Profit = Rs.33.000

Ratio among shares.

1st : 2nd : 3rd

3 : 5 : 3

Sum of ratios = $3 + 5 + 3 = 11$

Share of 1st Partner $= \frac{3}{11} \times 33000 =$ Rs.9000 Ans.

Share of 2nd Partner $= \frac{5}{11} \times 33000 =$ Rs.15000 Ans.

Share of 3rd Partner $= \frac{3}{11} \times 33000 =$ Rs.9000 Ans.

Q.6- Three members of a firm divide the profit amounting Rs.1,44,000 among themselves in the ratio 3:4:5.

(i) What is the biggest share of the profit?

(ii) What is the smallest share of the profit?

Solution:-

The profit, that is to be distributed = Rs.$1,44,000$

Given Ratios $= 3 : 4 : 5$

Sum of ratios $= 3 + 4 + 5 = 12$

(i) The Biggest share $= \frac{5}{12} \times 144000 =$ Rs.$60,000$ Ans.

(ii) The Samlliest share $= \frac{3}{12} \times 144000 =$ Rs.36000 Ans.

Multiple Choice Question

Tick ✓ the Correct Choice.

(i) Profit is equal to

(a) S.P – C.P (b) C.P – S.P

(c) Discount (d) Non of these

(ii) Profit % age is equal to

(a) $\frac{\text{Profit}}{\text{C.P}} \times 100$ (b) $\frac{\text{Profit}}{\text{S.P}} \times 100$

(c) $\frac{\text{C.P}}{\text{Profit}} \times 100$ (d) Non of these *(iii)* If C.P = *200* and S.P = *240* then Profit % age is

(a) 10% *(b) 20%*

(c) 40% *(d) 50%*

(iv) A book is sold for Rs.*650* at a profit of *30%*. Its Cost Price is

(a) Rs.*400* *(b)* Rs.*500*

(c) Rs.*600* *(d)* Rs.*550*

(v) Loss % age is equal to

(a) $\frac{\text{Loss}}{\text{S.P}} \times 100$ *(b)* $\frac{\text{Loss}}{\text{C.P}} \times 100$

(c) $\frac{\text{C.P}}{\text{Loss}} \times 100$ *(d)* $\frac{\text{S.P}}{\text{Loss}} \times 100$

(vi) Loss is incurred if

(a) $S.P > C.P$ *(b)* $C.P < C.P$

(c) $C.P = S.P$ *(d)* $C.P \neq S.P$

(vii) If C.P = Rs.*950*, Profit = *10%* then S.P is

(a) Rs.*1050* *(b)* Rs.*1045*

(c) Rs.*1105* *(d)* Rs.*995*

(viii) Difference between Marked Price and the Selling Price is called.

(a) Profit *(b)* Loss

(c) Discount *(d)* Tex

(ix) If M.P = Rs.*2760*. Discount = Rs.*5%*. Then Selling Price is

(a) Rs.*2620* *(b)* Rs.*2622*

(c) Rs.*2624* *(d)* Rs.*2626*

(x) When Partners invest capitals for different periods of times, the partnership is called

(a) Simple *(b)* Compound

(c) Mixed *(d)* Ordinary

(xi) Loss is equal to

(a) C.P – S.P *(b)* S.P – C.P

(c) M.P – S.P *(d)* Discount

(xii) The rebate on marked Price is called

(a) Commission *(b)* Profit

(c) Discount *(d)* Loss

(xiii) Discount is equal to

(a) M.P – S.P *(b)* S.P – M.P

(c) S.P + Profit *(d)* Loss

Model Class Test

Q.1- Encircle the Correct Answer.

(i) Loss is equal to

(a) S.P – C.P *(b)* C.P – S.P

(c) M.P – S.P *(d)* S.P – M.P

(ii) C.P = Rs.*250*, S.P = Rs.*265*, Then Profit % age is

(a) 5% *(b) 6%*

(c) 7% *(d) 8%*

(iii) M.P = Rs.*400*, S.P = Rs.*360*, Then discount % age is

(a) 5% *(b) 10%*

(c) 20% *(d) 15%*

(iv) Investors invest capital for the same period of time, the partnership is

(a) Simple *(b)* Complex

(c) Compound *(d)* Mixed

(v) In ratio, share of each partner is

(a) Capital × Period *(b)* $\frac{\text{Capital}}{\text{Period}}$

(c) Capital + Period *(d)* Capital – Period

(vi) Profit % age is equal to

(a) $\frac{\text{Profit}}{\text{S.P}} \times 100$ *(b)* $\frac{\text{Profit}}{\text{C.P}} \times 100$

(c) $\frac{\text{S.P} - \text{C.P}}{\text{S.P}} \times 100$ *(d)* $\frac{\text{S.P} - \text{C.P}}{\text{C.P}} \times 100$

(vii) S.P + Loss = ...

(a) C.P *(b)* M.P

(c) M.P − C.P *(d)* C.P − M.P

Q.2- Solve any five short questions.

(i) Find Profit % age if C.P = Rs.*3450* and S.P = Rs.*3850*

(ii) Find C.P if S.P = Rs.*650* and Profit % age = Rs.*30%*

(iii) Find Selling Price of a toy if the Marked Price is Rs.*720* and *2%* Discount is given.

(iv) Find the discount % age if a book with marked value Rs.*340* is sold for Rs.*306*.

(v) Define Compound Partnership?

(vi) Distribute Rs.*200,000* in three Persons in the ratio *3 : 2 : 5*.

(vii) The Profit of Rs.*67,200* is to be divided among three persons in the ratio *2 : 3 : 7*. Find biggest share.

Q.3- Attempt any two questions.

(i) If the selling price of *10* articles is, equal to the cost price of *11* articles. Find the profit percentage.

(ii) A shopkeeper offers a discount of *15%* on the marked price. How much percentage increase in cost price should be to mark the goods to give a profit of *19%*.

(iii) By selling *100* Oranges, a vendor gains the selling price of *20* Oranges. Find the profit percentage.

◆

UNIT 4 FINANCIAL MATHEMATICS

SHORT QUESTIONS

Q.1- What are the major types of bank accounts?

Ans. There are three Major types of bank accounts

(i) **Current Account:-**

This type of account is with highest degree of liquidity: Due to this quality, it is very Popular.

(ii) **Saving Account:-**

People keep this account to deposite their savings for long time. This kind of accounts are an important source of funds for the bank.

(ii) **Fixed Account:-**

This is a long time fixed account and a bank gets funds for long term lending and investment purposes.

Q.2- Define "Profit on deposit".

Ans. When a bank uses our money in some business, the bank pays some return for using our amount this return is called profit on deposit

Q.3- Explain the term "Mark up"

Ans. When some person borrows funds from a bank, he has to pay some extra amount for using the funds. This extra amount is called mark up.

Q.4- What is the difference between simple and compound interest?

Ans. Profit on principle amount is called simple interest. If profit or interest for one year is added to the principle amount then this sum is considered principle for the next year and the interest on this kind of amount is called compound interset.

Q.5- What are the formulas to find simple and compound interest?

Ans. For simple profit, we use formula

$$\text{Simple Profit} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

For Compund Profit, the formula is

$$\text{Proncipal} + \text{Compound Profit} = \text{Principal}\left[\frac{100 + \text{Rate}}{100}\right]^{\text{Time}}$$

or $$\text{Final Amount} = \text{Principal}\left[1 + \frac{\text{Rate}}{100}\right]^{\text{Time}}$$

Q.6- Rs.4000 were invested at 5% for 3 years. Find the compound as well as simple profit.

Solution:-

$\text{Principal} = \text{Rs. } 4000$, $\text{Time} = 3$ years

$\text{Rate} = 5\%$

$$\text{Simple Profit} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$\frac{4000 \times 5 \times 3}{100} = 600 \text{ Ans.}$$

Now

$$\text{Proncipal} + \text{Compound Profit} = \text{Principal} \times \left[\frac{100 + \text{Rate}}{100}\right]^{\text{Time}}$$

$$\text{Final Amount} = 4000 \times \left[\frac{100 + 5}{100}\right]^{3}$$

$$= 4000 \times \frac{105}{100} \times \frac{105}{100} \times \frac{105}{100} = \text{Rs.}4630.50$$

$$\text{Copound Profit} = \text{Rs.}4630.50 - \text{Rs.}4000$$

$$= \text{Rs.}630.50 \text{ Ans.}$$

Q.7- Write the formulas to find the mark up on loan for annual, monthly or daily bases.

Ans. $$\text{Mark up (Per anum)} = \frac{\text{Amount Borroued} \times \text{Rate} \times \text{Years}}{100}$$

$$\text{Mark up (Per month)} = \frac{\text{Amount Borroued} \times \text{Rate} \times \text{Months}}{12 \times 100}$$

$$\text{Mark up (Per day)} = \frac{\text{Amount Borroued} \times \text{Rate} \times \text{Days}}{365 \times 100}$$

Q.8- What do you mean by insurance?

Ans. Insurance is an agreement between two parties where by a party agrees to pay an amount by installments to an insurance company and the company covess or indemnify the rises to the life or other thing for which the insurence is made.

Q.9- What do you mean by leasing?

Ans. Lease is a contract where by the owner of an asset gives the hires the right to use the asset for a specified period in exchange of rental payment.

Q.10- Define the term "Down Payment".

Ans. The payment deposited by the customer to the bank along with the application form is called "Down Payment".

SOLVED EXERCISES

EXERCISE 4.1

Q.1- Convert 250 US Dollars into sterling Pound.

Solution:-

Buying rate of 1 Us Dollar $=$ Rs.83.800

Price of 250 US Dollars $= 250 \times 83.800 =$ Rs.20950

Rate of 1 Pound $=$ Rs.129.7968

There for

$$250 \text{ US Dollars} = \frac{20950}{129.2768} = 161.4060 \text{ Pounds}$$

Q.2- Convert 5000 Riyals into Pak rupee.

Solution:-

Price of 1 Riyal $=$ Rs.22.3449 Pak Rupees

Price of 5000 Riyal $= 5000 \times 22.3449$ Pak Rupees

$= \text{Rs.}1,11,724.5$

Q.3 An importer imports a car from Japan for 5000 Yen. Delivery was to be made after three months. At the time of contract Rs1 = 0.895236 Yen. At the time of delivery Rs 1 = 0.892236 Yen. Payment was made at the time of contract. Determine the profit or loss of the importer.

Solution:- At the time of contract

0.895236 Yen $=$ Re 1

$$1 \text{ Yen} = \text{Rs}\frac{1}{0.895236}$$

$$5000 \text{ Yen} = \text{Rs}\frac{1}{0.895236} \times 5000$$

$$5000 \text{ Yen} = \text{Rs } 5585.12$$

Similarly at the time of delivery

$$5000 \text{ Yen} = \text{Rs}\frac{1}{0.892236} \times 5000 \quad = \text{Rs } 5603.90$$

Therefore, Profit $=$ Rs $5603.90 -$ Rs 5585.12 $=$ Rs 18.78 Ans.

Q.4- A customer wants to convert 150 American dollers into rupees. He goes to an authorised dealer. He offers him conversion at the rate of 1 dollar = Rs.84.100. If it is converted with a money changer, the rate is 1 dollers = Rs.83.4495, determine the amount into rupees if it is converted with:

(i) Authorised dealer *(ii)* Money Changer

(iii) The loss due to conversion with the money changer.

Solution:-

Amount = 150 US Dollers

(i) For authorised dealer.

1 Doller = Rs 84.100

Thus 150 Dollers = Rs 150×84.100 = Rs. 12615 Ans.

(ii) For Money changer

1 Doller = Rs 83.4495

150 Dollers = Rs 150×83.4495 = Rs 12517.42

(iii) Loss due to conversion with the

Money changer = Rs $12615 - 12517.42$

= Rs 97.58 Ans.

Q.5- Rate of tea in Pakistan is Rs.21.0 per pound. Determine the rate per Kilogram, if

(i) $1kg = 2.2$ Pound

(ii) What will be the rate in Saudi Arabia if Saudi

1 Riyal = Rs.22.400.

Solution:-

1 kg = 2.2 pounds

Rate of tea for 1 pound = Rs 21.00

(i) Rate of tea for 1 kg = Rs 21.00×2.2

= Rs 42.42

(ii) Now

Rs.22.400 = 1 Riyal

$$\text{Re.}1 = \frac{1}{22.400}\ \text{Riyal}$$

$$\text{Rs.}42.42 = 42.42 \times \frac{1}{22.400}$$

= 1.89375 Riyal per kg. Ans.

Q.6- An exporter of carpets exports to England Carpets amounting to 40000 Sterling Pound. The spot buying rate exchange at that time was Rs.129.4542 to 1 Sterling. He receives the amount at the time when rate is Rs.129.0599 to 1 Sterling. How much he looses?

Solution:-

Amount $= 40{,}000$ Sterling Pounds

At the time of exportation

1 Sterling Pound $=$ Rs.129.4542

4000 Sterling Pound $= 40000 \times 129.4542$

$= 5178168$ Pak Rupees

At the time of recieving amount

1 Sterling Pound $=$ Rs.129.0599

4000 Sterling Pound $= 40000 \times 129.0599 = 5162396$

Loss = 5178468 – 5162396 = Rs. 15772

Q.7- A Pakistani living in Saudi Arabia earns 4370 Riyals a month. His monthly expenses comes to 3450 Riyals. He remits his saving monthly to Pakistan. How much he saved in a year if rate of exchange is Rs.22.400 = 1 Saudi Riyals. After a year Rate of exchange is Rs.22.3004. Determine the loss due to monthly remitance.

Solution:-

Monthly earning $= 4370$ Riyals

Monthly expenses $= 3450$ Riyals

Monthly saving $= 920$ Riyals

Saving in a year $= 920 \times 12, = 11040$ Riyals

Rate of exchange

1 Saudi Riyal $=$ Rs.22.400

11040 Saudi Riyal $= 11040 \times 22.400$

$= 247296$ Pak Rupees

After one year.

1 Saudi Riyal = Rs.22.3004

11040 Saudi Riyal = Rs.11040×22.3004

$= 246196.42$ Pak Rupees

His Profit $= 247296 - 246196.42$

$= 1099.58$ Pak Rupees Ans.

Q.8- Rizwan purchases a car in Saudi Arabia for 15000 Riyals. Delivery was to be made after three months and payment is also to be made at the time of delivery. At the time of contract, the rate was 1 Riyal = Rs.22.400, while at the time of delivery the rate was 1 Riyal=Rs.22.0827. Determine the loss in rupees due to change in the rate.

Solution:- At the time of Contract

Rate of 1 Riyal = Rs.22.400

15000 Riyal = Rs.22.400×15000

$= 336000$ Pak Rupees

At the time of delivery

1 Riyal = Rs.22.0827 Rupees

15000 Riyal = Rs.$22.0827 \times 15000 = 331240.5$

Profit of Rizwan = $336000 - 331240.5$

$= 4759.5$ Pak Rupees

Q.9- A friend of Ali living in Saudi Arabia remits Ali 450 Riyals. The bank offers two conversions rate. T.T. Buying Rs.22.3449 = 1 Riyal T/C Buying Rate: Rs.22.2146 = 1 Riyal Which one of the rate will be applicable and also calculate the amount in rupees.

Solution:-

T.T Buying Rs.$22.3449 = 1$ Riyal

and T/c Buying Rate Rs.$22.2146 = 1$ Riyal

As TT Buying rate is more than T/c Buying rate. So TT buying is applicable. Ali's freind will buy TT.

He will get Pak rupees $= 22.3449 \times 450$

$= 10055.20$ Ans.

EXERCISE 4.2

Q.1- A financial institution charges Rs.55 simple profit on a sum of money which is borrowed for five months. Given that the rate of profit is 12% per annum, find the sum of money.

Solution:- We are given that

Simple Profit = Rs55

Time = 5 months = $\frac{5}{12}$ Years

Rate = 12% Per annum

Principal = ?

$$\text{Principal} = \frac{100 \times \text{Simple Profit}}{\text{Rate} \times \text{Time}} = \frac{100 \times 55}{12 \times \frac{5}{12}}$$

$$= \frac{100 \times 55}{5} = 1100 \text{ Rupees Ans.}$$

Q.2- Mrs.Javed invests in Savings Scheme Rs.800 at 6% per annum and Rs.1,200 at 7% per annum. What is her total amount of profit on these two investments?

Solution:- For first investment

$$\text{Simple Profit} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$= \frac{800 \times 1 \times 6}{100} = \text{Rs}48$$

For the 2nd investemnt.

$$\text{Simple Profit} = \frac{1200 \times 7 \times 1}{100} = \text{Rs}84$$

$$\text{Total Profit} = 48 + 84 = \text{Rs}132 \text{ Ans.}$$

Q.3- How long would Rs.1.250 have to be deposited at 6% per year simple profit to gain Rs.750 simple profit?

Solution:-

$$\text{Simple Profit} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$\text{Time} = \frac{\text{S.P} \times 100}{\text{Principal} \times \text{Rate}}$$

$$= \frac{\overset{\overset{10}{\cancel{30}}}{\cancel{750}} \times \overset{\cancel{5}}{\cancel{10}}\cancel{0}}{\underset{\cancel{5}}{\cancel{125}}\cancel{0} \times \underset{\cancel{3}}{\cancel{6}}} = 10\text{years. Ans.}$$

Q.4- Ali lent to Abid Rs.4,800 for 7 months. At the end of this period Abid had to pay Ali profit of Rs.119. What was the rate of simple profit per annum?

Solution:-

$$\text{Rate} = \frac{\text{Simple Profit} \times 100}{\text{Principal} \times \text{Time}} = \frac{119 \times 100}{4800 \times \frac{7}{12}}$$

$$= \frac{\overset{17}{\cancel{119}} \times \cancel{100}}{\cancel{400} \times \cancel{7}} = \frac{17}{4} = 4.25\%\text{Per year}$$

Q.5- In a certain year, Javed puts Rs.600 in a private bank at the end of March and Rs.400 in the same bank at the end of June. The bank offers 3% per annum simple profit rate. Find the total amount Javed receives from the bank at the end of December in that year?

Solution:- Javed invested Rs.600 for

9 months or $\frac{9}{12}$ years.

∴ Profit for Rs.600

$$=\frac{6\cancel{00}\times 3\times\frac{9}{12}}{1\cancel{00}}$$

$$=6\times\frac{9}{4}=\frac{27}{2}=13.5 \qquad =\text{Rs}13.5$$

He invested Rs.400 for 6 months.

Or $\frac{6}{12}=\frac{1}{2}$ year

$$\therefore \text{Profit for Rs.}400=\frac{4\cancel{00}\times 3\times\frac{1}{2}}{1\cancel{00}}=\text{Rs}6.$$

Total Profit $=\text{Rs.}13.5+\text{Rs.}6=\text{Rs.}19.5$

Thus

Javed will recieve the total amount

$=\text{Rs.}600+\text{Rs.}400+\text{Rs.}19.5$

$=\text{Rs}1019.5$ *Ans.*

Q.6- At what annual rate of profit would a sum of Rs.680 will increase to Rs.850 in 3 years and 4 months?

Solution:-

Principal = Rs680

Time = 3 years and 4 months $=3\frac{4}{12}$ years $=\frac{10}{3}$ years.

Rate = ?

Total Profit $=\text{Rs.}850-\text{Rs.}680=\text{Rs.}170$

Thus

$$\text{Rate}=\frac{\text{Profit}\times 100}{\text{Principal}\times\text{Time}}=\frac{\cancel{17}\cancel{0}\times 100}{\underset{4}{\cancel{68}}\cancel{0}\times\frac{10}{3}}$$

$$=\frac{3\times 100}{4\times 10}=\frac{30}{4}=7.50\%\ \text{P.A Ans.}$$

Q.7- Copy and complete the following table with the help of formula given in this unit?

Solution:-

	Principle	Profit rate	Time	Simple Profit	Amount
(a)	Rs.12,000	8%	7 years	Rs.6720	Rs.18720
(b)	Rs.500	11%	4 years	Rs.220	Rs.720
(c)	Rs.300	9%	4 years	Rs.108	Rs.408
(d)	Rs.3000	4%	10 years	Rs.1,200	Rs.4200
(e)	Rs.3600	5%	2 years	Rs.360	Rs.3,960
(f)	Rs.1,800	7%	18 Month	Rs.189	Rs.1,989
(g)	Rs.4,500	6%	2 years	Rs.540	Rs.5,040
(h)	Rs.1200	5%	$1\frac{1}{2}$ years	Rs.90	Rs.1,290

Q.8- A bank increased the rate of profit from 3.5% to 4% per annum. Find how much more profit Saeed would receive if he deposited Rs.6400 in the bank for 6 months at the new profit rate.

Solution:- At the old profit rate

$$\text{Profit} = \frac{6400 \times \frac{1}{2} \times 3.5}{100}$$

$$= 32 \times \frac{7}{2} = \text{Rs}112$$

At new Profit rate

$$\text{Profit} = \frac{6400 \times \frac{1}{2} \times 4.0}{100}$$

$$= 32 \times 4 = \text{Rs.}128$$

The amount of more Proift $= \text{Rs.}128 - \text{Rs.}112 = \text{Rs.}16$ Ans.

Q.9- Mrs. Jamshed invested Rs.4000 in XYZ Bank Limited which paid simple profit at a rate $7\frac{1}{4}\%$ per annum to its investors. After 2 years, the rate was increased to 8% per annum. Find the amount she had at the end of 7 years.

Solution:-

$$\text{Profit of first twb years} = \frac{4000\times 7\frac{1}{4}\times 2}{100}$$

$$= 40\times\frac{29}{4}\times 2 = \text{Rs.}580$$

$$\text{Profit of last } 5 \text{ years} = \frac{40\cancel{00}\times 8\times 5}{1\cancel{00}} = \text{Rs.}1600$$

$\text{Total Proift} = \text{Rs.}1600 + \text{Rs.}580 = \text{Rs.}2180$ Ans.

$\text{Total Amount she had} = 4000 + 2180 = \text{Rs.}6180$ Ans.

Q.10- Mr.Dawood deposits a certain sum of money in ABC Limited. If the profit rate of the bank decreases from $3\frac{3}{4}\%$ per annum to $3\frac{1}{2}\%$ per annum, Mr. Dawood's profit will decrease by Rs.50 in a years. Find the sum of money he deposits.

Solution:-

$$\text{Difference of two rates} = 3\frac{3}{4} - 3\frac{1}{2} = \frac{1}{4}\%$$

Therefore Profit is decreased by Rs.50 at the rate of $\frac{1}{4}\%$ during one year. Thus

$$\text{Principal} = \frac{\text{Profit}\times 100}{\text{Time}\times\text{Rate}}$$

$$= \frac{50 \times 100}{1 \times \frac{1}{4}} = 5000 \times 4 = 20,000$$

Principal $= \text{Rs.}20000$ Ans.

Q.11- Find the compound profit on.

(i) Rs.450 for 2 years at 10% per annum compounded yearly;

(ii) Rs.700 for 3 years at 11% per annum compounded yearly;

(iii) Rs.5000 for 2 years at $11\frac{3}{4}$ per annum compounded yearly;

(iv) Rs.1200 for 3 years at 4% per annum compounded yearly;

(v) Rs.10000 for 3 years at $7\frac{1}{2}$ per annum compounded yearly;

Solution:-

(i) $$\text{Final Amount} = \text{P} \times \left[1 + \frac{\text{Rate}}{100}\right]^{\text{Time}}$$

$$\text{Final Amount} = 450 \times \left[1 + \frac{10}{100}\right]^{2}$$

$$= 450 \times (1.1)^2$$

$$= 450 \times (1.21) = 544.5$$

Compound Profit = Final Amount − Principal

$$= 544.5 - 450 = \text{Rs.}94.50 \text{ Ans.}$$

(ii) $$\text{Final Amount} = \text{Princpal} \times \left[1 + \frac{\text{Rate}}{100}\right]^{\text{Time}}$$

$$= 700 \times \left[1 + \frac{11}{100}\right]^{3}$$

$$= 700 \times (1.11)^3$$
$$= 700 \times (1.3676) = 957.34$$

$$\text{Compound Profit} = \text{Final Amount} - \text{Principal}$$
$$= \text{Rs.}957.34 - \text{Rs.}700$$
$$= \text{Rs.}257.34 \text{ Ans.}$$

(iii) $$\text{Final Amount} = \text{Princpal} \times \left[1 + \frac{\text{Rate}}{100}\right]^{\text{Time}}$$

$$= 5000 \times \left[1 + \frac{11.75}{100}\right]^2$$
$$= 5000 \times (1.1175)^2$$
$$= 5000 \times (1.2488) = 6244.03$$

$$\text{Compound Proift} = \text{Rs.}6244.03 - \text{Rs.}5000$$
$$= \text{Rs.}1244.03 \text{ Ans.}$$

(iv) $$\text{Final Amount} = \text{Princpal} \times \left[1 + \frac{\text{Rate}}{100}\right]^{\text{Time}}$$

$$= 1200 \times \left[1 + \frac{4}{100}\right]^3$$
$$= 1200 \times (1.04)^3 = 1200 \times (1.1249)$$
$$= \text{Rs.}1349.88$$

$$\text{Compound Profit} = 1349.88 - 1200 = 149.88$$

(v) $$\text{Final Amount} = \text{Princpal} \times \left[1 + \frac{\text{Rate}}{100}\right]^{\text{Time}}$$

$$= 10000 \times \left[1 + \frac{7.50}{100}\right]^3$$
$$= 10000 \times (1.075)^3 = 10000(1.2423)$$
$$= \text{Rs.}12422.97$$

$$\text{Compound Profit} = \text{Final Amount} - \text{Principal}$$
$$= \text{Rs.}12422.97 - 10000$$
$$= \text{Rs.}2422.97 \text{ Ans.}$$

Q.12- Waseem invests Rs.5000 at $5\frac{1}{4}\%$ per annum profit compounded annually. Find the amount at the end of the third year.

Solution:-

At the end of the third year.

$$\text{Total Amount} = \text{Princpal} \times \left[1 + \frac{\text{Rate}}{100}\right]^{\text{Time}}$$

$$= 5000 \times \left[1 + \frac{5.25}{100}\right]^{3}$$

$$= 5000 \times (1.0525)^{3}$$

$$= 5000 \times (1.1659)$$

$$= \text{Rs.}5829.57 \text{ Ans.}$$

Q.13- Javed invests Rs.800 at $12\frac{1}{2}\%$ per annum compound profit compounded half-yearly. What is the amount at the end of the first year?

Solution:-

Principal = Rs.800, Rate $= 12\frac{1}{2}\% = 12.50\%$ PA

Time = One year

= 2 terms of half years.

Because Profit is Compounded half yearly

So Rate = 6.25 half yearly.

$$\text{Final Amount} = \text{Princpal} \times \left[1 + \frac{\text{Rate}}{100}\right]^{\text{Time}}$$

$$= 800 \times \left[1 + \frac{6.25}{100}\right]^{2}$$

$$= 800 \times (1.0625)^{2}$$

$$= \text{Rs.}903.13 \text{ Ans.}$$

Q.14- Mr.saleem invests Rs.9000 at 2% per annum compound profit compounded daily. What is his amount at the end of the third day.

Solution:-

Principal = Rs.9000

Rate = 2% Per annum.

Time = 3 Days.

As the Profit is compounded daily

So Rate $= \frac{2}{365}\%$ Daily.

$$\therefore \text{Final Amount} = 9000 \times \left[1 + \frac{\frac{2}{365}}{100}\right]^3$$

$$= 9000 \times \left[1 + \frac{2}{36500}\right]^3$$

$$= 9000 \times (1.0000548)^3$$

$$= \text{Rs.}9001.48 \text{ Ans.}$$

EXERCISE 4.3

Q.1- A man borrowed Rs.1460 from ABC Bank on the 3rd of March at $12\frac{1}{2}\%$ What should he pay on the 1st of July to pay off the debt.

Solution:-

Principal = Rs.1460.

Rate $= 12\frac{1}{2}\% = 12.50\%$ P.A.

Time = 3rd of March to 1st of July.

$= 121$ days $= \frac{121}{365}$ years.

$$\text{Mark up} = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$= \frac{146\cancel{0} \times 121 \times 12.50}{365 \times 10\cancel{0}} = \text{Rs.}60.5$$

Thus Total amount = Principal + Mark up

$$= \text{Rs.}1460 + \text{Rs.}60.5 = \text{Rs.}1520.5 \ Ans.$$

Q.2- A shopkeeper borrowed Rs.3540 from ABC Bank at $10\frac{3}{4}\%$ and lent the whole amount at $11\frac{1}{2}\%$ on the same day, what would he gain from this after 3 years and 4 months.

Solution:- Principal = Rs.3540

$$\text{Rate} = 10\frac{3}{4}\%\ \text{P.A.} = 10.75\ \text{P.A.}$$

Time = 3 year and 4 months.

$$= 3\frac{4}{12}\ \text{years} = \frac{10}{3}\ \text{years.}$$

$$\text{Bank's Mark up} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$= \frac{3540 \times 10.75 \times \frac{10}{3}}{100}$$

$$= \frac{\overset{118}{\cancel{354}}\cancel{0} \times 10.75 \times 1\cancel{0}}{10\cancel{0} \times \cancel{3}} = \text{Rs.}1268.50$$

$$\text{Profit gained by him} = \frac{3540 \times 11.50 \times 10}{100 \times 3} = \text{Rs.}1357$$

He will given = Rs.1357 − Rs.1268.50 = Rs.88.50 Ans.

Q.3- XYZ Bank gained Rs.8034 on its loan at 6% compound markup in 2 years. What amount did it lend?

Solution:-

Let us suppose the Principal amount is Rs.100. Then

$$\text{Final Amount} = 100 \times \left[1 + \frac{6}{100}\right]^2$$

$$= 100 \times (1.06)^2$$

$$= 100 \times (1.1236)$$

$$= \text{Rs.}12.36$$

$$\text{Compound Profit} = \text{Final Amount} - \text{Principal}$$

$$= \text{Rs.}112.36 - \text{Rs.}100$$

$$= \text{Rs.}12.36$$

So For the Profit of Rs.12.36, loan = Rs.100

$$\text{For the Profit of Rs.}1\text{, loan} = \text{Rs.}\frac{100}{12.36}$$

$$\text{For the Profit of Rs.}8034\text{, loan} = \text{Rs.}\frac{100}{12.36} \times 8034$$

$$= \text{Rs.}65000 \text{ Ans.}$$

Q.4- A Company borrowed Rs.6,600 from ABC Bank Ltd at 8% simple markup per annum. How much did the company owe to the bank at the end of 11 months?

Solution:-

Principal Amonunt = Rs.6,600

Rate = Simple Markup 8% P.A.

$$\text{Time} = 11 \text{ months} = \frac{11}{12} \text{ years.}$$

$$\text{Simple Mark up} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$= \frac{\overset{\overset{11}{\cancel{55}\,\cancel{11}}}{\cancel{6600}} \times \overset{4}{\cancel{8}} \times 11}{\underset{\cancel{2}}{\cancel{100}} \times \cancel{12}} = \text{Rs.}484$$

$$\text{Total amount} = \text{Principal} + \text{Mark up}$$

$$= \text{Rs.}6600 + \text{Rs.}484$$

$$= \text{Rs.}7084 \text{ Ans.}$$

Q.5- XYZ Bank charges 2.25% per month simple markup on personal loans. If Ali borrows Rs.6,400 for a period of 2 years 1 month, find the total markup he has to pay to XYZ Bank.

Solution:-

Principal amount = Rs.$6,400$

Rate of Simple Markup = 2.25% Per Month.

Time = 2 years 1 month = 25 Months.

$$\text{Simple Mark up} = \frac{\text{Principal}\times\text{Rate}\times\text{Time}}{100}$$

$$= \frac{64\cancel{00}\times 2.25\times 25}{\cancel{100}}$$

$$= 64\times 2.25\times 25 = \text{Rs.}3600\ Ans.$$

Q.6- Find out the compound markup on Rs.250,000 for one year @ 14 % compounded annually.

Solution:-

Principal = Rs.$250,000$, Time = 1 year

Compouned Markup rate = 14% P.A.

$$\text{Total Amount} = \text{Principal}\times\left[1+\frac{\text{Rate}}{100}\right]^{\text{Time}}$$

$$= 250,000\times\left[1+\frac{14}{100}\right]^{1}$$

$$= 250,000(1.14) = \text{Rs.}285,000$$

$$\text{Mark up} = \text{Total amount} - \text{Principal}$$

$$= \text{Rs.}285,000 - 250,000$$

$$= \text{Rs.}35000\ Ans.$$

Q.7- Find compound profit on Rs.600, for 4 years at 6 percent per annum.

Solution:-

Principal = Rs.600, Time = 4 years.

Compouned Profit rate = 6% P.A.

$$\text{Total Amount} = \text{Principal} \times \left[1 + \frac{\text{Rate}}{100}\right]^{\text{Time}}$$

$$= 600 \times \left[1 + \frac{6}{100}\right]^{4}$$

$$= 600(1.06)^{4} = 600(1.262477)$$

$$= \text{Rs.}757.49$$

$$\text{Compound Profit} = \text{Rs.}757.49 - 600 = \text{Rs.}157.49 \; Ans.$$

Q.8- Find the compound profit of Rs.50000 at 4% for $1\frac{1}{2}$ years.

Solution:-

$\text{Principal} = \text{Rs.}50,000$

$\text{Rate} = 4\%$ P.A.

$\text{Time} = 1\frac{1}{2}$ years.

$$\text{Total Amount} = \text{Principal} \times \left[1 + \frac{\text{Rate}}{100}\right]^{\text{Time}}$$

$$= 50,000 \times \left[1 + \frac{4}{100}\right]^{1\frac{1}{2}}$$

$$= 50,000 \times \left[1 + \frac{4}{100}\right]\left[1 + \frac{2}{100}\right]$$

$$= 50,000(1.04)(1.02) = \text{Rs.}53040$$

$$\text{Compound Profit} = \text{Rs.}53040 - \text{Rs.}50000$$

$$= \text{Rs.}3040 \; Ans.$$

Q.9- Find the compound profit on Rs.54000 for one year at 12% per annum.

Solution:-

$$\text{Total Amount} = \text{Principal} \times \left[1 + \frac{\text{Rate}}{100}\right]^{\text{Time}}$$

$$= 54,000 \times \left[1 + \frac{12}{100}\right]^{1}$$

$$= 54,000 \times (1.12) = \text{Rs.}60480$$

$$\text{Compound Profit} = \text{Rs.}60480 - \text{Rs.}54000$$

$$= \text{Rs.}6480\ Ans.$$

EXERCISE 4.4

Q.1- If the amount of premium is calculated as.

Yearly premium = @ *4.5%* of the policy income

+ policy fee @ *0.25%* of the policy amount or at the most Rs.*200.*

Half yearly premium @ *52%* of yearly premium.

Quarterly premium @ *27%* of yearly premium.

Monthly premium @ *9%* of yearly premium.

Then complete the table below for calculation of the premiums.

Also find the total amount he pays to the company.

Amount of policy	*Yearly premium*	*Half yearly premium*	*Quarterly premium*	*Monthly premium*
(i) 50,000				
(ii) 100,000				
(iii) 150,000				
(iv) 200,000				

Solution:-

(i) Amount of Policy = Rs.*50,000*

$$\text{Yearly premium @}4.5\% = \text{Rs.}\frac{4.5}{100} \times 50000 = \text{Rs.}2250$$

$$\text{Policy Fee @ }0.25\% = 50000 \times \frac{0.25}{100} = \text{Rs.}125$$

$$\text{Total amount of yearly Premium} = \text{Rs.}2250 + \text{Rs.}125$$

$$= \text{Rs.}2375\ \text{Ans.}$$

Half yearly Premium $= 52\%$ of yearly Premium

$$= \frac{52}{100} \times 2375 = \text{Rs.}1235 \text{ Ans.}$$

Quaterly Premium $= \text{Rs}\frac{27}{100} \times 2375 = \text{Rs.}641.50$ Ans.

Monthly Premium $= \frac{9}{100} \times 2375 = \text{Rs.}213.75$ Ans.

(ii) Amount of Policy $= \text{Rs.}100,000$

Yearly premium @$4.5\% = \text{Rs.}\frac{4.5}{100} \times 100000$

$$= \text{Rs.}4500 \text{ Ans.}$$

Policy Fee @ $0.25\% = \frac{0.25}{100} \times 100000 = 250 > 200$

Thus Policy fee $= 200$

Total amount of yearly Premium $= 4500 + 200$

$$= \text{Rs.}4700.00 \text{ Ans.}$$

Half yearly Premium $= \frac{52}{100} \times 4700 = \text{Rs.}2444.00$ Ans.

Quaterly Premium $= \text{Rs}\frac{27}{100} \times 4700 = \text{Rs.}1269.00$ Ans.

Monthly Premium $= \frac{9}{100} \times 4700 = \text{Rs.}423.00$ Ans.

(iii) Amount of Policy $= \text{Rs.}150,000$

yearly Premium $= \frac{4.5}{100} \times 150000 = 6750.00$

Policy fee $= \text{Rs.}200.00$

Total amount of yearly Premium $= 6750 + 200$

$$= \text{Rs.}6950.00 \text{ Ans.}$$

Half yearly Premium $= \frac{52}{100} \times 6950 = \text{Rs.}3614$ Ans.

Quaterly Premium $= \text{Rs}\frac{27}{100}\times 6950 = \text{Rs.}1876.50$ Ans.

Monthly Premium $=\frac{9}{100}\times 6950 = \text{Rs.}625.30$ Ans.

(iv) Amount of Policy $= \text{Rs.}200000.00$

yearly Premium $=\frac{4.5}{100}\times 200000 = 9000 = 200$

Total yearly Premium $= 9000+200 = \text{Rs.}9200.00$ Ans.

Half yearly Premium $=\frac{52}{100}\times 9200 = \text{Rs.}4784.00$ Ans.

Quaterly Premium $= \text{Rs}\frac{27}{100}\times 9200 = \text{Rs.}2484.00$ Ans.

Monthly Premium $=\frac{9}{100}\times 9200 = \text{Rs.}828.00$ Ans.

Q.2- Calculate the amount to be received by the heirs of an insured if he died 2 years after buying the policy while.

The amount of policy = Rs.50,000

Premium is fixed @ 4.2% yearly

Policy fee @ 0.3%

Family income contract @ 0.6%

Maturity period = 22 years

Bonus @ 4.5% and Rs.6000 yearly income is promised by the company.

Solution:-

Policy Amount = Rs.50,000.00

Bonus for two years @4.5% $= \frac{50000\times 4.5\times 2}{100}$

$= 4500$

The family will get 6,000 yearly as income for next 20 years.

Total family income. $= 6000 \times 20 =$ Rs.$120{,}000$

Total Amount $= 50{,}000.00 + 4500 + 120{,}000$

$=$ Rs174500 Ans.

Q.3- Mr. Ahmed Ali insured his house worth Rs.75,00,000 @ 2% for 4 years calculae the amount paid in 4 years, while the rate of depreciation is 10% yearly.

Solution:-

Amount of Policy $=$ Rs.$75{,}00{,}000$

$$\text{Ist Premium @}2\% = \frac{2}{100} \times 75{,}00{,}000 = 1{,}50{,}000$$

$$\text{Depreciation @}10\% = \frac{10}{100} \times 75{,}00{,}000 = 7{,}50{,}000$$

Value of house after one year.

$= 75{,}00{,}000 - 7{,}50{,}000$

$=$ Rs.$67{,}50{,}000$

$$2nd \text{ Premium @}2\% = \frac{2}{100} \times 67{,}50{,}000 = \text{Rs.}1{,}35{,}000$$

After two years

$$\text{Depreciation @}10\% = \frac{10}{100} \times 67{,}50{,}000 = \text{Rs.}6{,}75{,}000$$

Depreciation value $=$ Rs.$(67{,}50{,}000 - 6{,}750{,}00)$

$=$ Rs.$60{,}75{,}000$

$$3rd \text{ Premium @}2\% = \frac{2}{100} \times 60{,}75{,}000$$

$=$ Rs.$1{,}21{,}500$

After 3 year

$4th$ Premium $= 0$

Total amount paid in 4 years

$=$ Rs.$(150{,}000 + 135{,}000 + 121{,}500 + 0)$

$=$ Rs.406500 *Ans.*

Q.4- Mr. Nadeem insured his shop @3% for 3 years, the depreciation rate is 5% yearly. If he paid an amount of Rs.21000 as the 1st premium, what is the worth of his shop. If he got a claim of Rs.200,000 after two years, how much benefits did he get?

Solution:-

3% of worth of shop $=$ $1st$ Premium

$\therefore\ \frac{3}{100}$ of worth of shop $=$ Rs.2100

$\therefore$ Worth of shop $= \frac{100}{3} \times 21000 =$ Rs.$700,000$

After one year

Depreciation $@5\% = \frac{5}{100} \times 700000 =$ Rs.$35,000$

Depreciated value $=$ Rs.$(700,000 - 35000)$

$=$ Rs.665000

$2nd$ Premium $@3\% = \frac{3}{100} \times 665,000 =$ Rs.19950

Total amount paid in 2 years $=$ Rs.$(21000) + (19950)$

$=$ Rs.40950

Amount of claim $=$ Rs.$200,000$

Benefits $=$ Rs.$(200,000 - 40950) =$ Rs.159050 *Ans.*

Q.5- Mr. Adil bought a running business worth Rs.10,00,000 and got it insured @2.5% as yearly premium for 4 years. After 3 years he got a claim of Rs.500,000 for actual damages. How much loss had he recovered through insurance?

Solution:-

Amount of Policy $=$ Rs.$10,00,000$

$1st$ Premium $@2.5\% = \frac{2.5}{100} \times 10,00,000$

$= \text{Rs.}25{,}000$

$\text{Depreciation @}10\% = \frac{10}{100} \times 10{,}00{,}000$

$= \text{Rs.}1{,}00{,}000$

$\text{Depreciated value} = \text{Rs.}(10{,}00{,}000 - 1{,}00{,}000)$

$= \text{Rs.}9{,}00{,}000$

$2nd \text{ Premium @}2.5\% = \frac{2.5}{100} \times 9{,}00{,}000 = \text{Rs.}22{,}500$

After 2 years.

$\text{Depreciation @}10\% = \frac{10}{100} \times 9{,}00{,}000 = \text{Rs.}90{,}000$

$\text{Depreciated value} = \text{Rs.}(9{,}00{,}000 - 90{,}000)$

$= \text{Rs.}8{,}10{,}000$

$3rd \text{ Premium @}2.5\% = \frac{2.5}{100} \times 8{,}10{,}000 = \text{Rs.}20{,}250$

After 3 years.

Total amount paid as Premiums =

$= \text{Rs.}(25{,}000 + 22500 + 20250) = \text{Rs.}67750$

$\text{Claim Recieved} = \text{Rs.}5{,}00{,}000$

$\text{Mr. Adil recovered} = \text{Rs.}(5{,}00{,}000 - 67{,}750)$

$= \text{Rs.}4{,}32{,}250 \text{ Ans.}$

Q.6- Mr. Javeed bought an insurance policy against his car worth Rs.8,50,000, @ 4.25% for 3 years. What total amount will he pay as premium, if he had not claimed and damages during the period? Where depreciation is 10%.

Solution:-

$\text{Amount of Policy} = \text{Rs.}8{,}50{,}000$

$1st \text{ Premium @}4.5\% = \frac{4.5}{100} \times 8{,}50{,}000 = \text{Rs.}36{,}125$

After one year,

$$\text{Depreciation } @10\% = \frac{10}{100} \times 8,50,000 \quad = \text{Rs.}85,000$$

$$\text{Depreciated value} = \text{Rs.}(8,50,000 - 85,000)$$

$$= \text{Rs.}7,65,000$$

$$2nd \text{ Premium } @4.25\% = \frac{4.25}{100} \times 7,65,000$$

$$= \text{Rs.}32512.50$$

$$3rd \text{ Premium} = 0$$

$$\text{Total payment} = \text{Rs.}(36,125 + 32,512.50)$$

$$= \text{Rs.}68637.50$$

Q.7- Mr. Rehman bought a vehicle worth Rs.7,50,000. He got it insured @3.5% for 5 years. How much he paid in total for covering the risks, if he had got a claim of damages worth Rs.100,000 during the period? Where depreciation is 10%.

Solution:-

$$\text{Value of vehicle} = \text{Rs.}7,50,000$$

$$1st \text{ Premium } @3.5\% = 7,50,000 \times \frac{3.5}{100} \quad = \text{Rs.}26250$$

After one year,

$$\text{Depreciation } @10\% = \frac{10}{100} \times 7,50,000 \quad = \text{Rs.}75,000$$

$$\text{New value} = \text{Rs.}(7,50,000 - 75,000) \quad = \text{Rs.}6,75,000$$

$$2nd \text{ Premium } @3.5\% = \frac{3.5}{100} \times 6,75,000 \quad = \text{Rs.}23625$$

After 2 years.

$$\text{Depreciation } @10\% = \frac{10}{100} \times 6,75,000 \quad = \text{Rs.}6,75,00$$

$$\text{New value} = \text{Rs.}(6,75,000 - 67,500) \quad = \text{Rs.}60,75,00$$

$$3rd \text{ Premium } @3.5\% = \frac{3.5}{100} \times 60,75,00 \quad = \text{Rs.}21262.50$$

After 3 years.

$$\text{Depreciation } @10\% = \frac{10}{100}\times 60{,}75{,}00 = \text{Rs.}60750$$

$$\text{New value} = \text{Rs.}(6{,}07{,}500-60750) = \text{Rs.}546750$$

$$4th\text{ Premium } @3.5\% = \frac{3.5}{100}\times 546750 = \text{Rs.}19136.25$$

$$5th\text{ Premium} = 0$$

$$\text{Total payment} = \text{Rs.}(26{,}250+23{,}625+21262.50+19136.25)$$

$$= \text{Rs.}90273.75$$

$$\text{Claim Recieved} = \text{Rs.}1{,}00{,}000$$

$$\text{Benefit} = \text{Rs.}(1{,}00{,}000-90273.75) = \text{Rs.}9726.25\ Ans.$$

Q.8- Ms. Maria bought an insurance policy @3.25% for her car for 3 years. Her 1st premium is Rs.26000. Tell the price of her car. Also calculate the amounts of her 2nd and 3rd premium.

Solution:-

$$1st\text{ Premium} = \text{Rs.}26000$$

$$\therefore\ 3.25\%\text{ of Price of car} = \text{Rs.}26000$$

$$\text{Price of car} = 26000\times\frac{100}{3.25}$$

$$= \frac{26000\times 100\times 100}{325} = \text{Rs.}8{,}00{,}000\text{ Ans.}$$

After one year,

$$\text{Depreciation } @10\% = \frac{10}{100}\times 8{,}00{,}000$$

$$= \text{Rs.}80{,}000$$

$$\text{New value} = \text{Rs.}(8{,}00{,}000-80{,}000) = \text{Rs.}7{,}20{,}000$$

$$2nd\text{ Premium } @3.25\% = \frac{3.25}{100}\times 7{,}20{,}000$$

$$= \text{Rs.}23400\text{ Ans.}$$

$$3rd\text{ Premium} = 0\text{ Ans.}$$

EXERCISE 4.5

Q.1- For each of the following.

(i) find the additional amount you have to pay by financing and

(ii) express the additional amount obtained in as a percentage of the cash price:

Financing Term				
Cash(Rs.)		*Down(Rs.)*	*Monthly instalment(Rs.)*	*Number of instanlments*
(a)	*Rs.360*	*Rs.50*	*Rs.40*	*10*
(b)	*Rs.900*	*Rs.150*	*Rs.75*	*12*
(c)	*Rs.25000*	*Rs.10000*	*Rs.500*	*36*

Solution:-

(a) Cash Price = Rs.360

Down Payment = Rs.50

Payment by instalments = Rs.40×10

= Rs.400

Total Payment = Rs.400 + Rs.50 = Rs.450

Additional Amount = Payment − Cash Price.

$= (450-360) =$ Rs.90 Ans.

Percentage of Cash Price $= \frac{90}{360}\times 100 = 25\%$ Ans.

(b) Cash Price = Rs.900

Down Payment = Rs.150

Payment by instalments = Rs.75×12 = Rs.900

Total Payment = Rs.900 + Rs.150 = Rs.1050

Additional Payment = Rs.$(1050-900)$ = Rs.150 Ans.

Percentage of Cash Price $= \frac{150}{900}\times 100 = 16\frac{2}{3}\%$ Ans.

(c) Cash Price = Rs.$25,000$

Down Payment = Rs.$10,000$

Payment in instalments = Rs.(500×36)

= Rs.$18,000$

Total Payment = Rs.$(10000 + 18,000)$ = Rs.$28,000$

Additional Payment = Total Payment – Cash Price.

= Rs.$(28000 - 25,000)$ = Rs.3000 Ans.

Percentage of Cash Price $= \frac{3000}{25000} \times 100 = 12\%$ Ans.

Q.2- Pervaiz buys a window air-conditioner at Rs.900. He pays 20% deposit and the outstanding balance plus markup in 48 months. Markup on the balance is charged at 10%. Find

(i) the cost of his monthly instalment;

(ii) the amount he saves by paying cash.

Solution:-

Cash Price = Rs.900

Cash Payment = 20% of Rs.900

$= \frac{20}{100} \times 900 =$ Rs.180

Remaining amount = Rs.720, Time = 4 years.

Mark up $= \frac{720 \times 10 \times 4}{100} = 288$

Total amont to be paid = Rs.$(720 + 288)$ = Rs.1008

Payment in each instalment

$= \frac{1008}{48} =$ Rs.21 Ans.

Total Payment = Rs.$(180 + 1008)$ = Rs.1188

By Paying Cash Price, he can save.

= Rs.$(1188 - 900)$

= Rs.288 *Ans.*

Q.3- On each of the following

(i) find the financial price of the goods and

(ii) express the amount saved by paying cash as a percentage of the cash price

	Item	Cash Rs.	Deposit	Number of Instalments	Monthly Instalments Rs
(a)	Computer	Rs.200	10%	24	Rs.9
(b)	Printer	Rs.450	15%	18	Rs.25
(c)	Scanner	Rs.1600	25%	30	Rs.52

Solution:-

(a) Cash Price of Computer = Rs.200

Deposite $10\% = \frac{10}{100} \times 200 =$ Rs.20

Payment by instalments = $24 \times 9 =$ Rs.216

Total Payment = Rs.$(20 + 216) =$ Rs.236

Payment More than Cash Price = Rs.$(236 - 200) =$ Rs.36

Percentage $= \frac{36}{200} \times 100 = 18\%$ Ans.

(b) Cash Price of Printer = Rs.450

Cash deposite @$15\% = \frac{15}{100} \times 450 =$ Rs.67.50

Payment in instalments = Rs.$(25 \times 18) =$ Rs.450

Total Payment = Rs.$(450 + 67.50) =$ Rs.517.50

Amount paid more than cash price = $(517.50 - 450)$

= Rs.67.50

%age $= \frac{67.50}{450} \times 100 = 15\%$ Ans.

(c) Cash Price of Scanner = Rs.1600

Cash deposite @$25\% = \frac{25}{100} \times 1600 =$ Rs.400

Payment in instalments = Rs.(52×30) = Rs.1560

Total Payment = Rs.$(400+1560)$ = Rs.1960

Extra Payment = Rs.$(1960-1600)$ = Rs.360

%age = $\frac{360}{1600}\times 100 = 22.5\%$ Ans.

Q.4- For each of the following , find

(i) the monthly instalment and

(ii) the difference in the hire purchase price and the cash price as a percentage of the cash price:

	Cash Rs.	Hire-purchase terms
(a)	Rs.800	Rs.100 deposit; balance 8%; 1 year
(b)	Rs.8000	Rs.200 deposit; balance 10% $2\frac{1}{2}$ year
(c)	Rs.1200	Rs.200 deposit; balance 15% $1\frac{1}{3}$ year

Solution:-

(a) Cash Price = Rs.800

Cash Payment = Rs.100

Balance = Rs.$(800-100)$ = Rs.700

Mark up rate = 8% P.A

Time = 1 year.

Mark up amount = $\frac{700\times 8\times 1}{100} = 56$

Total amount to be paid in 12 monthly instalments = Rs.700 + Rs.56 = Rs.756

Payment of each instalments = Rs.$\frac{756}{12}$ = Rs.63 Ans.

Difference of hire purchase price and cash price = Rs.56 Ans.

%age = $\frac{56}{800}\times 100 = 7\%$ Ans.

(b) Cash Price = Rs.8000

Cash Payment = Rs.200

Balance = Rs.$(8000 - 200)$ = Rs.7800

Mark up rate = 10%

Amount mark up = $\dfrac{7800 \times 10 \times 2.5}{100}$ = Rs.1950

Total amount to be paid = Rs.$(7800 +$ Rs.$1950)$ = Rs.9750

Number of instalments = 2.5×12 = Rs.30

Payment in each instalment = $\dfrac{975\cancel{0}}{3\cancel{0}}$ = Rs.325 Ans.

Now mark up = Rs.11950

%age of cash price = $\dfrac{1950}{8000} \times 100$ = 24.75% Ans.

(c) Cash Price = Rs.1200

Cash Payment = Rs.200

Balance = Rs.$(1200 - 200)$ = Rs.1000

Mark up rate = 15%

Time = $1\frac{1}{3}$ years = $\frac{4}{3}$ years

Amount of mark up = $\dfrac{1000 \times 15 \times \frac{4}{3}}{100}$ = Rs.200

Total amount to be paid in instalments

= Rs.$(1000 +$ Rs.$200)$ = Rs.1200

Number of instalments = $1\frac{1}{3} \times 12$ = 16 instalments

Each instalment = $\dfrac{1200}{16}$ = Rs.75

Now mark up = Rs.200

% age of cash price = $\dfrac{200}{1200} \times 100$ = $16\frac{2}{3}\%$ Ans.

Q.5- The cash price of a computer package deal was Rs.3200. Markup paid @ 15% down payment and the outstanding balance plus markup over 24 months. Markup on the balance was charged at 9.5%.

(i) Find the cost of the package deal if it is bought on hire-purchase.

(ii) Find the difference between the hire-purchase price and the cash price.

(iii) Express the difference obtained in (ii) as a percentage of the cash price.

Solution:- Cash Price $=$ Rs.3200

Down Payment $= 15\%$ of 3200

$$= \frac{15}{100} \times 3200 = \text{Rs.}480$$

Balance $=$ Rs.$(3200 - 480) =$ Rs.2720

Time $= 24$ months $= 2$ years

Rate of mark up $= 9.5\%$

$$\text{Amount of mark up} = \frac{9.5}{100} \times 2720 \times 2 = \frac{95}{100} \times 272 \times 2$$

$$= \frac{19}{20} \times 272 \times 2 = \frac{19}{10} \times 136 \times 2$$

$$= 258.40 \times 2 = \text{Rs.}516.80$$

Total amount to be paid $=$ Rs.$(2720 + 516.80)$

$=$ Rs.3236.80

Number of instalments $= 24$

$$\text{Amount of each instalment} = \frac{3236.80}{24} = \text{Rs.}134.87$$

Difference of two prices $=$ Mark up $=$ Rs.516.80 Ans.

Cost of package if bought on hire purchase

$=$ Cash price $+$ Mark up

$=$ Rs.$(3200 + 516.80) =$ Rs.3716.80 Ans.

$$\%\text{age of Mark up} = \frac{516.80}{3200} \times 100 = 16.15\% \text{ Ans.}$$

Review Exercise 4

Q.1- Encircle the correct answer.

(i) An instrument for payment order issued by a bank on the request of its customers is called:

(a) pay order *(b)* cheque

(c) bank draft *(d)* bill of exchange

(ii) The person or entity whose insurance is being done is called the:

(a) insurer *(b)* insured

(c) drawer *(d)* lessee

(iii) The company undertaking the act of insurance is called:

(a) insurer *(b)* insured

(c) insurance *(d)* insurance policy

(iv) The periodic instalment to be paid by the insured is called:

(a) bonus *(b)* discount

(c) premium *(d)* mark up

(v) The return earned by the bank on loan is named as:

(a) mark up *(b)* premium

(c) bonus *(d)* profit

(vi) The amount which is paid by the bank on the deposits is called:

(a) profit *(b)* bonus

(c) premium *(d)* mark up

(vii) The percentage of profit/markup charged is called:

(a) rate *(b)* time

(c) interest *(d)* principal

(viii) A machine installed by the bank to dispense cash to customer is called an:

(a) computer *(b)* scanner

(c) ATM *(d)* card reader

(ix) A bill of exchange drawn on a specified banker and not expressed to be payable otherwise then on demand is called:

(a) cheque *(b)* pay order

(c) bill of exchange *(d)* bank draft

(i) a	*(ii) b*	*(iii) a*	*(iv) c*	*(v) a*
(vi) a	*(vii) a*	*(viii) c*	*(ix) a*	

Q.2- Fill in the blanks.

(i) A bill of exchange drawn on a specified banker and not expressed to be payable otherwise then on demand is called a _____

(ii) An instrument like a cheque, issued by bank on the request of its customers is called_____

(iii) A machine installed by the bank to dispense cash to customers is called an_____

(iv) The amount which is paid by the bank on the deposits maintained by the client with the bank is called_____

(v) The percentage of profit charged is called_____

(vi) The period of the loan or deposit is called the_____

(vii) The return earned by the bank on loan is named as___

(viii) The periodic installment to be paid by the insured is called_____

(ix) The company undertaking the act of insurance is called the_____

(x) The person or entity whose insurance is being done is called the____

(i) Cheques	*(ii) Pay order*	*(iii) ATM*	*(iv) Profit*
(v) Rate	*(vi) Time*	*(vii) Mark up*	*(viii) Premium*
(ix) Insurer	*(x) Insured*		

Q.3- Raheel insured his house worth Rs.75,00,000 @ 2% of 5 years. Calculate the amount paid in 5 years, while the rate of depreciation is 10% yearly.

Solution:-

$$\text{Amount of Policy} = \text{Rs.}75{,}00{,}000$$

$$1st\ \text{Premium @}2\% = \frac{2}{100} \times 75{,}00{,}000 = \text{Rs.}1{,}50{,}000 \ldots (i)$$

After one year

$$\text{Depreciation @}10\% = \frac{10}{100} \times 75{,}00{,}000 = 7{,}50{,}000$$

$$\text{New value} = \text{Rs.}(75{,}00{,}000 - 7{,}50{,}000) = \text{Rs.}67{,}50{,}000$$

$$2nd\ \text{Premium @}2\% = \frac{2}{100} \times 67{,}50{,}000 = \text{Rs.}1{,}35{,}000 \ldots (ii)$$

After 2 years

$$\text{Depreciation @}10\% = \frac{10}{100} \times 67{,}50{,}000 = \text{Rs.}6{,}75{,}000$$

$$\text{New Price of house} = \text{Rs.}(67{,}50{,}000 - 6{,}75{,}000)$$

$$= \text{Rs.}60{,}75{,}000$$

$$3rd\ \text{Premium @}2\% = \frac{2}{100} \times 60{,}75{,}000 = \text{Rs.}1215{,}00 \ldots (iii)$$

After 3 years

$$\text{Depreciation @}10\% = \frac{10}{100} \times 60{,}75{,}000 = \text{Rs.}6{,}07{,}500$$

$$\text{Depreciated Value} = \text{Rs.}(60{,}75{,}000 - 6{,}07{,}500)$$

$$= \text{Rs.}54{,}67{,}500$$

$$4th\ \text{Premium @}2\% = \frac{2}{100} \times 54{,}67{,}500 = \text{Rs.}109350 \ldots (iv)$$

$$5th\ \text{Premium} = 0$$

Total amount paid =

$$= \text{Rs.}(1{,}50{,}000 + 1{,}35{,}000 + 1{,}21{,}500 + 109350)$$

$$= \text{Rs.}515850\ \text{Ans.}$$

Q.4- Naeem insured his factory @ 3% for 3 years. With depreciation rate 5% yearly. If first premium is Rs.21,000, find the worth of the factory. If he got a claim of Rs.200,000 after two years, how much benefits did he get?

Solution:-

$1st$ Premium $@3\%$ = Rs.$21,000$

3% of worth of factory = Rs.$21,000$

$\frac{3}{100}$ of worth of factory = Rs.$21,000$

Worth of factory $= 21,000 \times \frac{100}{3}$

= Rs.$7,00,000$

After one year

Depreciation $@5\% = \frac{5}{100} \times 7,00,000$

= Rs.$35,000$

Depreciated Value = Rs.$(7,00,000 - 35,000)$

= Rs.$6,65,000$

$2nd$ Premium $@3\% = \frac{3}{100} \times 6,65,000$

= Rs.19950

$3rd$ Premium $= 0$

Total amount paid as Premiums =

= Rs.$(21000 + 19950)$

= Rs.40950

Amount of claim = Rs.$2,00,000$

Benefit to $= 200,000 - 40950 =$ Rs.$159,050$ Ans.

Q.5- **M/s Rahim printer purchases under hire-purchase system a machine from Lahore company on 1st January 2000, paying cash Rs.10,000 and agreeing to pay three further instalments of Rs.10,000 each on 31st December every year. The cash price of the machine is Rs. 37,250 and the Lahore company charges markup at 5% p.a. Draw table showing installments (Principal + Markup).**

Solution:-

			Instalments	
S.No	*Date of Payments*	*Cash Price*	*Mark Up*	*Princepal*
1	*Down Payment on 1-1-2000*	37,250 10,000 27,250	Zero	10,000
2	*Less Paid on 31-12-2000*	27,250 8638 18,612	$27250\times\frac{5}{100}$ $=1362$	8638
3	*Less Paid on 31-12-2001*	18,612 9070 9542	$18612\times\frac{5}{100}$ $=930$	9070
4	*Less Paid on 31-12-2002*	9542 9542 Nill	458 Rs.2750	9542 37250

MULTIPLE CHOICE QUESTIONS

Tick the best choice.

(i) (PLS) Saving account was introduced in

(a) Jan.1980 *(b)* Jan.1981

(c) Jan.1982 *(d)* Jan.1983

(ii) A negotiable instrument means

(a) Promissory note (b) Bill of exchage

(c) Cheque (d) All of these

(iii) If 1 Riyal = Rs.22.400 , Then Rs.44800 is equal to

(a) 200 Riyals (b) 2000 Riyals

(c) 1900 Riyals (d) 2100 Riyals

(iv) If one dollar = Rs.84.100, Then Rs.150 dollars is equal to

(a) Rs.12610 (b) Rs.12615

(c) Rs.12620 (d) Rs.12620

(v) In Islamic Banking, The words Profit or Markup have been replaced with

(a) Benefit (b) Loss

(c) Interest (d) Incriment

(vi) Simple interest, for the investment of Rs.1000 for 2 years @ 10% per anum, is

(a) Rs.100 (b) Rs.200

(c) Rs.300 (d) Rs.250

(vii) Compound Profit + Princpal =

(a) $\text{Principal}\times\left[1+\frac{\text{Rate}}{100}\right]^{\text{Time}}$

(b) $\text{Principal}\times\left[1+\frac{\text{Time}}{100}\right]^{\text{Rate}}$

(c) $\text{Principal}\times\left[1-\frac{\text{Rate}}{100}\right]^{\text{Time}}$

(d) $\text{Principal}\times\left[1-\frac{\text{Time}}{100}\right]^{\text{Rate}}$

(viii) The time period agreed upon by both the Parities of insurance is called.

(a) Time (b) Maturity

(c) Rate (d) Premium

(ix) A car of price *Rs.12,50,000* is insured at the rate of *4.50%* P.A for five years. The premium for *5th* year is

(a) 39237 (b) 38217

(c) Zero (d) 39927

(x) The Periodic instalment to be paid by the insured is called

(a) Markup (b) Profit

(c) Insurence (d) Premium

(xi) The bank account having high value of liquidity is termed as.

(a) PLS Account (b) Saving Account

(c) Current Account (d) Foreign Currency Account

(xii) The return earned by the bank is named as

(a) Mark up (b) Interest

(c) Profit (d) Premium

MODEL CLASS TEST

Time : 40 mins Max Marks : 25

Q.1- Tich the best choice.

(i) If *1* Riyal = Rs.*22.300* , Then *1500* Riyal is equal to

(a) *Rs.33250* (b) *Rs.33350*

(c) *Rs.33450* (d) *Rs.33550*

(ii) If *1* Dollar = Rs.*85.200* , Then *Rs.12780* is equal to

(a) *1400* Dollars (b) *1500* Dollars

(c) *1600* Dollars (d) *1700* Dollars

(iii) The amount overpaid by the bank is called

(a) Mark up (b) Profit

(c) Interest (d) Principal

(iv) The return earned by the banks on loan is named as

(a) Profit (b) Mark up

(c) Interest (d) Principal

(v) Amount can be drawn from any branch of a bank, in case of

(a) Current Account *(b)* PLS Account
(c) Pay order *(d)* On line banking

(vi) If a car is insured for three years @ *3%* Then the third Premium is

(a) @ *1%* *(b)* @ *2%* *(c)* Zero *(d)* @ *3%*

(vii) The time agreed by both the parties of an insurance policy is called.

(a) Time *(b)* Period *(c)* Maturity *(d) Rate*

Q.2- Attempt any five short question.

(i) Define "Negotiable Anstrument".What are its kinds?

(ii) If the simple profit on Rs.*640* for *12* years is Rs.*384*. Find the rate of profit.

(iii) Find Compound Profit on Rs.*4000* at *5%* p.a for *3* years.

(iv) Ali bought an insurance policy against his car @ *3.25* for *3* years. He paid Rs.*26000* as 1st premium. Find the price of the car.

(v) Define the terms "Insurance Policy", Premium, bonus.

(vi) Convert *5,00,000* PKR into Euro if
If *1* Euro = *112.4088* PKR

(vii) Find simple Mark up on loan of Rs.*1,00,000* for *3* years @ *10%* p.a.

Attempt any two questions of the following.

Q.3- Find the Compound Profit of Rs.5000 @ 6% p.a, For 2 years compounded half yearly.

Q.4- Ahmad insured his house worth Rs.75,00,000 @ 2% for 4 years. Find the total amount paid in 4 years while depreciation is @ 10% yearly.

Q.5- Amjad Purchased a truck on hire Purchase for Rs.56,000 under the conditions.
Each instalment = Rs.1500
Rate of mark up = 5% p.a
Make a table of instalments.

UNIT 5 CONSUMER MATHEMATICS

SHORT QUESTIONS

Q.1- Differentiate direct and indirect taxes.

Ans. The taxes charged on income, Property and Profits in the form of income tax, Property tax etc are named as direct tax. Whereas the taxes charged on duties, motor vehicle taxes, goods and services taxes,.sales tax and value added tax etc are called indirect taxes.

Q.2- The marked Price of a T.V is Rs.18000. Calculate sales tax @ 16%.

Solution:- Marked Price = Rs.18000

$$\text{Tax} = 16\% \text{ of } 18000 = \frac{16}{100} \times 18000$$

Sales Tax = Rs.2880 Ans.

Q.3- Define Property tax.

Ans. Property tax is charged on the owner of land, houses, flats or buildings at a standard rate of 16% on the annual value of the Property.

Q.4 Write a "note" on income tax.

Ans. Income tax is charged on all kinds of incomes during the year from 1st July to 30th of June. This tax is not charged on exceeding amount.

Q.5- Define "tax".

Ans. Money that must be paid to the state, charged as a Proportion of income and Profits or value added to the cost of some goods and services is called a tax.

Q.6- The Price of a car is Rs.500,000. The buyer pays excise duty @150%. How much amount has to pay to purchase the car.

Solution:- Price $= \text{Rs.}500,000$

Excise duty $= 150\%$ of Price

$$= \frac{15}{100} \times 500,000 = 7,50,000$$

He has to Pay $= \text{Rs.}(5,00,000 + 7,50,000) = \text{Rs}(12,50,000)$ Ans.

SOLVED EXERCISES

EXERCISE 5.1

Q.1- The price of a bicycle is Rs. 3500. If 16% sales tax is charged, then calculate the amount of sales tax on 50 such bicycles.

Solution:-

Price of one bicycle $= \text{Rs.}3500$

Price of 50 bicycles $= \text{Rs.}(50 \times 3500) = \text{Rs.}175000$

Sales Tax $= 16\%$ of $\text{Rs.}175000$

$$= \frac{16}{100} \times 175000 = \text{Rs.}28000$$

Q.2- If the price of an air conditioner is Rs. 40,000, then work out the amount of sales tax on it at the rate of 16%. Also calculate the price of air conditioner with sales tax.

Solution:-

Price of A.C (Excluded sales tax) $= \text{Rs.}40,000$

Price of A.C $= 40000$

Sales Tax $= 16\%$ of $\text{Rs.}\,40000$

$$= \frac{16}{1\cancel{00}} \times 400\cancel{00}$$

$$= \text{Rs.}6400$$

Price of A.C with Sales tax $= 40000 + 6400$

$= \text{Rs.}46400$

Q.3- The price of two cars of 1300 cc and 1600 cc without excise duty are 6,00,000 and Rs. 8,00,000 respectively. If the excise duty on these two are 200% and 250% respectively. Find the prices of the two cars inclusive duties.

Solution:-

For the $1300\ CC$ Car

Price without excise duty $= \text{Rs.}6{,}00{,}000$

Excise duty $= 200\%$ of $\text{Rs.}6{,}00{,}000$

$$= \frac{200}{100} \times 6{,}00{,}000 = 12{,}00{,}000$$

Price (Included excise duty) $= \text{Rs.}(6{,}00{,}000 + 12{,}00{,}000)$

$= \text{Rs.}18{,}00{,}000$ Ans.

For the Car of $1600CC$

Price (without duty) $= 8{,}00{,}000$

$$\text{Excise duty} = \frac{250}{100} \times 8{,}00{,}000 = 20{,}00{,}000$$

Price (Included excise duty) $= \text{Rs.}(8{,}00{,}000 + 20{,}00{,}000)$

$= \text{Rs.}28{,}00{,}000$ Ans.

Q.4- The annual price of a house and price of land is Rs. 15,00,000 and Rs. 20,00,000 respectively. Find the property tax on each of these two at the rate of 16%.

Solution:-

Annual Price of house $= \text{Rs.}15{,}00{,}000$

$$\text{Property tax @}16\% = \frac{16}{1\cancel{00}} \times 15{,}00{,}0\cancel{00} = \text{Rs.}2{,}40{,}000 \text{ Ans.}$$

Annual Price of land $= \text{Rs.}20{,}00{,}000$

$$\text{Property tax @}16\% = \frac{16}{1\cancel{00}} \times 20{,}00{,}0\cancel{00} = \text{Rs.}3{,}20{,}000 \text{ Ans.}$$

Q.5- The total taxable income of two persons is Rs.2,50,000 and Rs. 3,10,000 respectively. Work out the income tax for each of them @ 4.5%.

Solution:- For the *1st* Person

Income Tax = 4.5% of taxable income.

$$= \frac{4.5}{100} \times 2,50,000$$

$$= \text{Rs.}11250$$

For the *2nd* Person.

Income Tax = 4.5% of taxable income.

$$= \frac{4.5}{100} \times 3,10,000$$

$$= \text{Rs.}13950 \text{ Ans.}$$

Q.6- The total taxable income of a person is Rs.4,30,000. If he is given rebate Rs. 3000 on the tax chargeable, then work out the amount he has to pay as an income tax @ 4.5%.

Solution:-

Income Tax = 4.5% of Income.

$$= 4.5\% \text{ of } 4,30,000$$

$$= \frac{4.5}{100} \times 4,30,000 = \text{Rs.}19350$$

Rebate given to him = Rs.3000

Payable income tax = Rs.$(19350 - 3000)$

$$= \text{Rs.}16350 \text{ Ans.}$$

Q.7- If the total annual income of a person is Rs.6,25,000 with exemption of amount of Rs. 1,50,000, then find the tax chargeable @ 4.5%.

Solution:-

Total annual Income = Rs.$6,25,000$

Exemption of amount = Rs.$1,50,000$

Tax able income = Rs.$(6,25,000-1,50,000)$

$=$ Rs.$4,75,000$

Tax $@4.5\% = \frac{4.5}{100}\times 4,75,000$ $=$ Rs.21375 Ans.

Q.8- **The total income of a person is Rs. 5,25,000. Whereas the exemption is Rs. 1,50,000. Work out the tax payable @ 4.5% along with the income tax payable, if Rs. 10,000 has already been deducted at source as income tax.**

Solution:-

Total Income = Rs.$5,25,000$

Exemption = Rs.$1,50,000$

Tax able income = Rs.$(5,25,000-1,50,000)$

$=$ Rs.$3,75,000$

Tax $@4.5\% = \frac{4.5}{100}\times 3,75,000$ $=$ Rs.16875

Deduction = Rs.10000

Tax Payable = Rs.$(16875-10000)$ $=$ Rs.6875 Ans.

EXERCISE 5.2

Q.1- **In the following the gas meter reading has been given. Complete the gas bills with the help of the slabs given in the unit. Also include the meter rent and GST.**

(i) $3.0756\ Hm^3$ **(ii)** $4.285\ Hm^3$

(iii) $2.796\ Hm^3$ **(iv)** $1.378\ Hm^3$

(v) $5.235\ Hm^3$ **(vi)** $4.665\ Hm^3$

Solution:-

(i) Meter reading $= 3.0756$ Hm^3

1 Hm^3 $= 3.25$ M M B T U(nearly)

Thus

Meter reading $= 3.0756\text{ Hm}^3$

$= 3.0756 \times 3.25$

$= 9.9957$ M M B T U(nearly)

Now consider the table.

Hm^3	MMBTU	Rate Rupee/MMBTU	Price (Rs) MMBTU × Rate
First 0.5 Hm^3	0.5×3.25 $=1.625$	Rs.80.65	1.625×80.65 $=131.06$
Next 0.5 Hm^3	1.625	Rs.84.45	137.23
Next 1.0 Hm^3	3.25	Rs.153.73	499.62
Next 1.0 Hm^3	3.25	Rs.325.48	1057.81
Next 0.0756 Hm^3	0.2457	Rs.423.42	104.03
Total $= 3.0756\text{ Hm}^3$	9.9957		Total = 1929.75

Total Price of gas $= 1929.75$

Meter Rent $= 20.00$

Total $= 1949.75$

G.S.Tax @ 16% $= \dfrac{16}{100} \times 1949.75$

$= 311.96$

Amount of Bill $= 1949.75 + 311.96 = 2261.71$

$= 2261.71$ Ans.

(ii) Meter reading $= 4.285\text{ Hm}^3$

We Know that $1\text{ Hm}^3 = 3.25$ M M B T U(nearly)

Thus

Meter reading $= 4.285\text{ Hm}^3$

$= 4.285 \times 3.25$

$= 13.92625$ M M B T U(nearly)

Now consider the table.

Hm^3	MMBTU	Rate Rupee/MMBTU	Price (Rs) MMBTU × Rate
First 0.5 Hm^3	0.5×3.25 $=1.625$	Rs.80.65	1.625×80.65 $=131.06$
Next 0.5 Hm^3	1.625	Rs.84.45	137.23
Next 1.0 Hm^3	3.25	Rs.153.73	499.62
Next 1.0 Hm^3	3.25	Rs.325.48	1057.81
Next 1.0 Hm^3	3.25	Rs.423.42	1376.12
Next 0.285 Hm^3	0.92625	Rs.550.44	509.83
Total $=4.285$ Hm^3			Total $=3711.67$

Total Price of gas $= 3711.67$

Meter Rent $= 20.00$

Total $= 3731.67$

G.S.Tax @ 16% $= \frac{16}{100}\times3731.67$

$= 597.07$

Amount of Bill $= 3731.67 + 597.07 = 4328.74$

$= 4328.74$ Ans.

(iii) Meter reading $= 2.796$ Hm^3

1 $Hm^3 = 3.25$ M M B T U(nearly)

Thus

Meter reading $= 2.796$ $Hm^3 = 3.25\times2.796$.

$= 9.087$ M M B T U(nearly)

Now consider the table.

Hm^3	MMBTU	Rate Rupee/MMBTU	Price (Rs) MMBTU × Rate
First 0.5 Hm^3	0.5×3.25 $=1.625$	Rs.80.65	1.625×80.65 $=131.06$

Next 0.5 Hm^3	1.625	Rs.84.45	137.23
Next 1.0 Hm^3	3.25	Rs.153.73	499.62
Next 0.796 Hm^3	2.587	Rs.325.48	842.02
Total $= 2.796$ Hm^3			Total = 1609.93

Gas charges = Rs.1609.93

Meter Rent = 20.00

Total = 1629.93

$$\text{G.S.Tax @ 16\%} = \frac{16}{100} \times 1629.93$$

$$= 260.79$$

Amount of Bill = $1629.93 + 260.79$ = Rs.1890.72

= Rs.1890.72 Ans.

(vi) Meter reading = 1.378 Hm^3

$1\ Hm^3 = 3.25$ M M B T U(nearly)

Thus

Meter reading = 1.378 Hm^3

$= 1.378 \times 3.25$

$= 4.4785$ M M B T U(nearly)

Now consider the table.

Hm^3	MMBTU	Rate Rupee/MMBTU	Price (Rs) MMBTU × Rate
First 0.5 Hm^3	0.5×3.25 $=1.625$	Rs.80.65	1.625×80.65 $= 131.06$
Next 0.5 Hm^3	1.625	Rs.84.45	137.23
Next 0.378 Hm^3	1.2285	Rs.153.73	188.86
Total $= 1.378$ Hm^3			Total = 457.15

Gas charges = Rs.457.15

Meter Rent = 20.00

Total = $Rs.477.15$

G.S.Tax @ 16% $= \frac{16}{100} \times 477.15 = 76.34$

Total Amount of Bill = $477.15 + 76.34 = 553.49$

$= 553.49$ Ans.

(v) Meter reading = 5.235 Hm^3

We Know that 1 Hm^3 = 3.25 M M B T U(nearly)

So Meter reading = 5.235 Hm^3

$= 5.235 \times 3.25$ MMBTU

$= 17.01375$ M M B T U

Now consider the table.

Hm^3	MMBTU	Rate Rupee/MMBTU	Price (Rs) MMBTU × Rate
First 0.5 Hm^3	0.5×3.25 $= 1.625$	$Rs.80.65$	1.625×80.65 $= 131.06$
Next 0.5 Hm^3	1.625	$Rs.84.45$	137.23
Next 1.0 Hm^3	3.25	$Rs.153.73$	499.62
Next 1.0 Hm^3	3.25	$Rs.325.48$	1057.81
Next 1.0 Hm^3	3.25	$Rs.423.42$	1376.12
Next 1.0 Hm^3	3.25	$Rs.550.44$	1788.93
Next 0.235 Hm^3	0.76375	$Rs.730.17$	557.67
Total $= 5.235$ Hm^3			Total = 5548.44

Gas charges = 5548.44

Meter Rent = 20.00

Total = 5568.44

G.S.Tax @ 16% $= \frac{16}{100} \times 5568.44 = Rs.890.95$

Total Amount of Bill $= 5568.44 + 890.95 = Rs.6459.39$ Ans.

(vi) Meter reading $= 4.665$ Hm^3

1 Hm^3 $= 3.25$ M M B T U(nearly)

So Meter reading $= 4.665$ Hm^3 $= 3.25 \times 4.665$

$= 15.16125$ M M B T U(nearly)

Now consider the table.

Hm^3	MMBTU	Rate Rupee/MMBTU	Price (Rs) MMBTU × Rate
First 0.5 Hm^3	0.5×3.25 $=1.625$	$Rs.80.65$	1.625×80.65 $=131.06$
Next 0.5 Hm^3	1.625	$Rs.84.45$	137.23
Next 1.0 Hm^3	3.25	$Rs.153.73$	499.62
Next 1.0 Hm^3	3.25	$Rs.325.48$	1057.81
Next 1.0 Hm^3	3.25	$Rs.423.42$	1376.12
Next 0.665 Hm^3	2.16125	$Rs.550.44$	1189.64
Total $= 4.665$ Hm^3			Total $= 4391.48$

Gas charges $= 4391.48$

Meter Rent $= 20.00$

Total $= 4411.48$

$$\text{G.S.Tax @ 16\%} = \frac{16}{100} \times 4411.48 = 705.84$$

Total amount of Bill $= 4411.48 + 705.84 = Rs.5117.32$ Ans.

Q.2- In the following the number of units consumed while using electricity is given. Complete the Electricity bills, including the items as well as shown in the solved example of electricity bill.

Solution:-

(i) Number of Units consumed $= 315$ Units

Cost of first 100 Units @Rs.$2.65 = 100 \times 2.65$

$= \text{Rs.}265.00$

Cost of next 200 Units @Rs.3.64 $= 200 \times 3.64$

$= \text{Rs.}728.00$

Cost of remaining 15 Units $= 15 \times 6.15$

$= \text{Rs.}92.25$

Total Cost of Electricity $= \text{Rs.}(265 + 728 + 92.25)$

$= \text{Rs.}1085.28 \text{ --- } (i)$

Exise duty @1.5% $= \frac{1.5}{100} \times 1085.28$

$= \text{Rs.}16.28 \text{ --- } (ii)$

Electricity duty $= \text{Rs.}19.04 \text{ --- } (iii)$

PTV fee $= \text{Rs.}25.00 \text{ --- } (iv)$

Income Tax $= \text{Rs.}27.50 \text{ --- } (v)$

Adding $i + ii + iii + iv + v$

$= \text{Rs.}1173.10$ Ans.

(ii) Number of Units $= 210$

Cost of first 100 Units @Rs.2.65 $= 100 \times 2.65$

$= \text{Rs.}265.00$

Cost of next 110 Units $= 110 \times 3.64$

$= \text{Rs.}400.4$

Total Cost of Electricity $= \text{Rs.}(265 + 400.4)$

$= \text{Rs.}665.40 \text{ --- } (i)$

Exise duty @1.5% $= \frac{1.5}{100} \times 665.4$

$= \text{Rs.}9.98 \text{ --- } (ii)$

Electricity duty $= \text{Rs.}19.04 \text{ --- } (iii)$

PTV fee $= \text{Rs.}25.00 \text{ --- } (iv)$

Income Tax $= \text{Rs.}27.50 \text{ --- } (v)$

Adding $i + ii + iii + iv + v$

Total Bill $= \text{Rs.}736.94$ Ans.

(iii) Number of Units consumed $= 375$ Units

Cost of first 100 Units @Rs.$2.65 = 100 \times 2.65$

$= \text{Rs.}265.00$

Cost of next 200 Units @Rs.$3.64 = 200 \times 3.64$

$= \text{Rs.}728.00$

Cost of remaining 75 Units $= 75 \times 6.15$

$= \text{Rs.}461.25$

Total Cost of Electricity $= \text{Rs.}1454.25 \ldots (i)$

Exise duty @$1.5\% = \frac{1.5}{100} \times 1454.25$

$= \text{Rs.}21.81$ ---(ii)

Electricity duty $= \text{Rs.}19.04$ ---(iii)

PTV fee $= \text{Rs.}25.00$ - - -(iv)

Income Tax $= \text{Rs.}27.50$- - -(v)

Adding $i + ii + iii + iv + v$

Total Bill $= \text{Rs.}1547.55$ Ans.

(iv) Units consumed $= 290$

Cost of first 100 Units @Rs.$2.65 = 100 \times 2.65$

$= \text{Rs.}265.00$

Cost of remaining 190 Units $= 190 \times 3.64$

$= \text{Rs.}691.6$

Total Cost of Electricity $= \text{Rs.}956.60$ ---(i)

Excise duty @$1.5\% = \frac{1.5}{100} \times 956.60$

$= \text{Rs.}14.35$ ---(ii)

Electricity duty $= \text{Rs.}19.04$ ---(iii)

PTV fee $= \text{Rs.}25.00$ ---(iv)

Income Tax $= \text{Rs.}27.50$ ---(v)

Adding $i + ii + iii + iv + v$

$= \text{Rs.}1042.49$ Ans.

Q.3- In the following the number of calls made is given. Complete the telephone bill including the items; Call rate Rs. 5 per call, CED @ 15%, W.H tax @ 4%.

(i)	**530**	*(ii)*	**640**	*(iii)*	**750**
(iv)	**270**	*(v)*	**480**	*(vi)*	**315**

Solution:-

(i) Number of Calls $= 530$

Call charges @ Rs.5 Per Call

$$= 530 \times 5 = \text{Rs.}2650$$

$$\text{CED @}15\% = \frac{15}{100} \times 2650 = \text{Rs.}397.50$$

$$\text{W.H Tax @}4\% = \frac{4}{100} \times 2650 = \text{Rs.}106$$

$$\text{Total amount Payable} = \text{Rs.}2650 + \text{Rs.}397.50 + \text{Rs.}106$$

$$= \text{Rs.}3153.50 \text{ Ans.}$$

(ii) Number of Calls $= 640$

Call charges @ Rs.5 Per Call

$$= 640 \times 5 = \text{Rs.}3200$$

$$\text{CED @}15\% = \frac{15}{100} \times 3200 = \text{Rs.}480$$

$$\text{W.H Tax @}4\% = \frac{4}{100} \times 3750 = \text{Rs.}150.00$$

$$\text{Total amount Payable} = \text{Rs.}(3750 + 562.50 + 150.00)$$

$$= \text{Rs.}4462.50 \text{ Ans.}$$

(iii) Number of Calls $= 750$

Call charges @ Rs.5 Per Call $= 750 \times 5$

$$= Rs.3750 \ldots (i)$$

$$\text{CED @}15\% = \frac{15}{100} \times 3750$$

$$= \text{Rs.}562.50 \ldots (ii)$$

W.H Tax $@4\% = \frac{4}{100} \times 3750$

$= \text{Rs.}150.00$

Total amount Payable $= \text{Rs.}(3750 + 562.50 + 150.00)$

$= \text{Rs.}4462.50$ Ans.

(iv) Number of Calls $= 270$

Call charges @ Rs.5 Per Call $= 270 \times 5 = \text{Rs.}1350$

CED $@15\% = \frac{15}{100} \times 1350 = \text{Rs.}202.50$

W.H Tax $@4\% = \frac{4}{100} \times 1350 = \text{Rs.}54.00$

Total amount Payable $= \text{Rs.}(1350 + 202.50 + 54.00)$

$= \text{Rs.}1606.50$ Ans.

(v) Number of Calls $= 480$

Call charges @ Rs.5 Per Call

$= 480 \times 5 = \text{Rs.}2400$

CED $@15\% = \frac{15}{100} \times 2400 = \text{Rs.}360$

W.H Tax $@4\% = \frac{4}{100} \times 2400 = \text{Rs.}96$

Total amount Payable $= \text{Rs.}(2400 + 360 + 96)$

$= \text{Rs.}2856$ Ans.

(vi) Number of Calls $= 315$

Call charges @ Rs.5 Per Call $= 315 \times 5 = \text{Rs.}1575$

CED $@15\% = \frac{15}{100} \times 1575 = \text{Rs.}236.25$

W.H Tax $@4\% = \frac{4}{100} \times 1575 = \text{Rs.}63.00$

Total amount Payable $= \text{Rs.}(1575 + 236.25 + 63)$

$= \text{Rs.}1874.25$ Ans.

EXERCISE 5.3

Q.1- A lady worker works a six-day week. She starts work at 7.00 am and finishes at 4pm. She has 15 minutes break in the morning and 45 minutes break in the afternoon. How long does she actually work in a week and how much she is paid, if the rate of payment is Rs.40 per hour?

Solution:-

As she starts at $7.00\,am$ and ends at $4.00\,pm$. So

Daily working hours $= 9$ hours

Daily break $= 1$ hour

Daily hours to be paid for $= 8$

Weekly hours $= 6 \times 8 = 48$ Ans.

Payment @Rs.40 per hours $= 48 \times 40 =$ Rs.1920 Ans.

Q.2-Khalid works 6 day-weeks. Find his gross monthly wage, if his rate of pay is Rs. 200 per day.

Solution:-

Weekly working days $= 6$

Monthly working days $= 4 \times 6 = 24$

Gross monthly wage @ Rs.200 per day.

$= 24 \times 200 =$ Rs.4800 Ans.

Q.3- Aslam gets paid Rs.70 per hour for his normal working 8 hours daily (6 day week). The rate of over time is 1.5 of Rs. 70 per hour. If he works 40 hours as overtime, then work out his gross monthly pay.

Solution:-

Daily working hours $= 8$

Weekly working hours $= 6 \times 8 = 48$

Monthly working hours $= 4 \times 48 = 192$

Payment for normal work $= 192 \times 70 =$ Rs.13440

Over time of 40 hours @ 1.5×70 per hour

$= 1.5\times 70\times 40 =$ Rs.4200

Gross monthly pay = Rs.$(13440 + 4200)$ = Rs.17640 Ans.

Q.4- Calculate the gross monthly pay of a person, if his basic pay is Rs.18000, house rent allowances is Rs,3500, dearness allowances is Rs.3000, conveyance allowance is Rs1500 and medical allowance is Rs.500.

Solution:-

Gross monthly pay = Basic pay + House rent allowance

+ Denner allowance + Conveyance allowance

+ Medical allowance

= Rs.$(18000 + 3500 + 3000 + 1500 + 500)$ = Rs.26500 Ans.

Q.5- If gross pay of a person is Rs.45,000, then calculate his net take home salary, after deductions of Rs.400 as income tax, Rs.1200 as benevolent fund, Rs.1500 as G.P fund and Rs.400 as group insurance.

Solution:-

Gross pay = Rs.$45,000$

Deductions = Income Tax + benevolent fund

G.P fund + Group insurance

= Rs.$(400 + 1200 + 1500 + 400)$ = Rs.3500

Net take home salary = Gross Pay – Deductions

= Rs.$(45000 - 3500)$ = Rs.41500 Ans.

Q.6- Noman works in a factory where the basic hourly rate is Rs.50 for a 35 hour week. An over time is paid at time and - a-half. How much will he earn in a week when he works for:

***(i)* 38 hours *(ii)* 48 hours *(iii)*. 50 hours**

Solution:-

(i) Number of hours = 38

Basic hourly rate for 35 hours = Rs.50 per hour

Payment for 35 hours $= 35 \times 50$

$= \text{Rs.}1750$

Payment for 3 hours $= 1.5 \times 50 \times 3$

$= \text{Rs.}225$

Gross Payment $= \text{Rs.}(1750 + 225)$

$= \text{Rs.}1975$ Ans.

(ii) Number of hours $= 48$

Payment for 35 hours $= 35 \times 50$

$= \text{Rs.}1750$

Payment for 13 hours $= 1.5 \times 50 \times 13$

$= \text{Rs.}975$

Gross Payment $= \text{Rs.}(1750 + 975)$

$= \text{Rs.}2725$ Ans.

(iii) Number of hours $= 50$

Payment for 35 hours $= 35 \times 50$

$= \text{Rs.}1750$

Payment for 15 hours $= 1.5 \times 15 \times 50$

$= \text{Rs.}1125$

Gross Payment $= \text{Rs.}(1750 + 1125)$

$= \text{Rs.}2875$ Ans.

Q.7- Abdullah's pay slip showed that he had worked 6 hours over time in addition to his basic 36 hours week. If his basic rate of pay is Rs.60 and over time is paid at time and a-half. Find his gross pay for the month.

Solution:-

Payment for 36 hours $= 36 \times 60 = \text{Rs.}2160$

Payment for 6 hours $= 1.5 \times 60 \times 6 = \text{Rs.}540$

Gross Pay for the week $= \text{Rs.}(2160 + 540) = \text{Rs.}2700$

Gross Pay for the month $= 4 \times 2700$

$= \text{Rs.}10800$ Ans.

Review Exercise-5

Q.1- Encircle the correct answer.

(i) Money that must be paid to the state charged as proportion of income and profit added to cost of some goods and services is called a

(a) tax *(b)* excise
(c) property tax *(d)* income tax

(ii) The taxes which are charged on income, property and profits in the from of income tax, property tax and profits etc is called

(a) tax *(b)* direct tax
(c) property tax *(d)* income tax

(iii) Taxes of the form of duties, motor vehicle taxes are called

(a) indirect tax *(b)* direct tax
(c) property tax *(d)* income tax

(iv) The tax in addition to the price of the article is called

(a) tax *(b)* sales tax
(c) income tax *(d)* excise duty

(v) The form of a tax which the buyer pays on a manufactured item at the time of purchase is called

(a) excise duty *(b)* tax
(c) income tax *(d)* sales tax

(vi) The tax charged on the owner of a land, house flats or building is called

(a) property tax *(b)* income tax
(c) direct tax *(d)* indirect tax

(vii) The tax charged on all the taxable income is called

(a) sales tax *(b)* direct tax
(c) income tax *(d)* excise duty

Ans:

(i) (a)	*(ii) (b)*	*(iii) (a)*	*(iv) (b)*
(v) (a)	*(vi) (a)*	*(vii) (c)*	

Q.2- Fill in the blanks.

(i) Money that must be paid to the state charged as a proportion of income and profits added to the cost of some goods and services is called a_____

(ii) The taxes which are charged on income, property and profits in the form of income tax, property tax and profit etc is called a_____

(iii) Taxes of the form of duties, motor vehicle taxes, goods and services are called_____

(iv) The tax in addition to the price of the article is called as_____

(v) The form of a tax which the buyer pay on a manufactured item at the time of purchase is called_____

(vi) The tax charged on the owner of a land, house, flats or building is called a_____

(vii) The tax charged on all taxable income is called_____

(viii) If the annual value of a flat is *Rs.6,00,000.* Then the tax payable at a rate of *15%* is_____

(ix) The value added tax at the rate of *10%* at the marked price of television of *Rs.12000* is_____

(x) The excise duty at rate of 150%, one has to pay against an amount of *Rs.3,00,000* is_____

Ans:

(i) (tax)	*(ii) (Direct tax)*	*(iii) (Indirect tax)*
(iv) (Sales tax)	*(v) (Excise duty)*	*(vi) (Property tax)*
(vii) (Income tax)	*(viii) (Rs.90,000)*	*(ix) Rs.(1200)*
(x) Rs.(450,000)		

Q.3- **The price of a tricycle is Rs.4000. If 16% sales tax is charged, then calculate the amount of sales tax on 30 such tricycles.**

Solution:-

Price of one tricycle = Rs.4000

$$\text{Sales Tax on one tricycle} = \frac{16}{100} \times 40000$$

$$= \text{Rs.}640$$

$$\text{Sales Tax on } 30 \text{ tricycles} = \text{Rs}(640 \times 30)$$

$$= \text{Rs.}19200 \text{ Ans.}$$

Q.4- **If the total income of a person is Rs.7,00,000 with exempted amount of Rs.1,50,000. Find the tax chargeable @ 4.5%.**

Solution:-

Total Income = Rs.$7,00,000$

Exempat amount = Rs.$1,50,000$

$$\text{Taxable income} = \text{Rs}(7,00,000 - 1,50,000)$$

$$= \text{Rs.}5,50,000$$

$$\text{Tax chargeable @}4.5\% = \frac{4.5}{100} \times 5,50,000$$

$$= \text{Rs.}24750 \text{ Ans.}$$

Q.5- **The gas meter shows that $5.670\,\text{Hm}^3$ gas was used during a month period. Workout the payable amount inclusive GST @16%.**

Solution:-

Meter reading $= 5.670\,\text{Hm}^3$

We Know $1\,\text{Hm}^3 = 3.25$ M M B T U(nearly)

So Meter reading $= 5.670\,\text{Hm}^3$

$$= 5.670 \times 3.25 \text{ MMBTU}$$

$$= 18.4275 \text{ M M B T U}$$

Now consider the table.

Hm^3	MMBTU	Rate Rupee/MMBTU	Price(Rs) MMBTU × Rate
First 0.5 Hm^3	0.5×3.25 $=1.625$	Rs.80.65	1.625×80.65 $=131.06$
Next 0.5 Hm^3	1.625	Rs.84.45	137.23
Next 1.0 Hm^3	3.25	Rs.153.73	499.62
Next 1.0 Hm^3	3.25	Rs.325.48	1057.81
Next 1.0 Hm^3	3.25	Rs.423.42	1376.12
Next 1.0 Hm^3	3.25	Rs.550.44	1788.93
Next 0.670 Hm^3	2.1775	Rs.730.17	1589.95
Total $=5.670\ Hm^3$			Total = 6580.72

Gas charges = Rs.6580.75

Meter Rent = 20.00

Total = Rs.6600.75

G.S.Tax @ 16% $= \frac{16}{100}\times 6600.75 = Rs.1056.12$

Total amount of Bill = (6600.75 + 1056.12)

= Rs.7656.87 Ans.

Q.6- The number of units consumed while using electricity is as under.

(i) 275 units (ii) 200 units

(iii) 340 units (iv) 285 units.

Complete the electricity bills, including the items as well as shown in the solved example of electricity bill.

Solution:-

(i) Units consumed = 275

Cost of first 100 Units @Rs.2.65 = 100×2.65

= Rs.265.00

Cost of 175 Units $= 175 \times 3.64$

$= \text{Rs.}637$

Total Cost of 275 Units $= \text{Rs.}(265 + 637)$

$= \text{Rs.}902 \ldots (i)$

Excise duty @$1.5\% = \dfrac{1.5}{100} \times 902$

$= \text{Rs.}13.530 \ldots (ii)$

Electricity duty $= \text{Rs.}19.04 \ldots (iii)$

PTV fee $= \text{Rs.}25.00 \ldots (iv)$

Income Tax $= \text{Rs.}27.50 \ldots (v)$

Adding $i + ii + iii + iv + v$

Total Bill $= \text{Rs.}(85.07 + 902)$

$= \text{Rs.}987.07$ Ans.

(ii) Number of Units $= 200$

Cost of first 100 Units @Rs.$2.65 = 100 \times 2.65$

$= \text{Rs.}265.00$

Cost of remaining 100 Units $= 100 \times 3.64.$

$= \text{Rs.}364$

Total Cost of 200 Units $= \text{Rs.}(364 + 265) = \text{Rs.}629 \ldots (i)$

Excise duty @$1.5\% = \dfrac{1.5}{100} \times 629$

$= \text{Rs.}9.44 \ldots (ii)$

Electricity duty $= \text{Rs.}19.04 \ldots (iii)$

PTV fee $= \text{Rs.}25.00 \ldots (iv)$

Income Tax $= \text{Rs.}27.50 \ldots (v)$

Adding $i + ii + iii + iv + v$

Total Bill $= \text{Rs.}710$ Ans.

(iii) Number of Units $= 340$

Cost of first 100 Units @Rs.$2.65 = 100 \times 2.65$

$= \text{Rs.}265.00$

Cost of 200 Units $= 200 \times 3.64$

$= \text{Rs.}728$

Cost of 40 Units $= 40 \times 6.15$

$= \text{Rs.}246.00$

Total Cost $= \text{Rs.}(265 + 728 + 246)$

$= \text{Rs.}1239$

Excise duty @$1.5\% = \frac{1.5}{100} \times 1239$

$= \text{Rs.}18.59$

Electricity duty $= \text{Rs.}19.04$

PTV fee $= \text{Rs.}25.00$

Income Tax $= \text{Rs.}27.50$

Total Bill $= \text{Rs.}(1239 + 18.59 + 19.04 + 25.00 + 22.50)$

$= \text{Rs.}1329$ Ans.

(iv) Number of Units $= 285$

Cost of first 100 Units @Rs.$2.65 = 100 \times 2.65$

$= \text{Rs.}265.00$

Cost of 185 Units $= 185 \times 3.64$

$= \text{Rs.}673.4$

Cost of 285 Units $= \text{Rs.}(265 + 673.4)$

$= \text{Rs.}938.4$

Exise duty @$1.5\% = \frac{1.5}{100} \times 938.4$

$= \text{Rs.}14.08$

Electricity duty $= \text{Rs.}19.04$

PTV fee $= \text{Rs.}25.00$

Income Tax $= \text{Rs.}27.50$

Total Bill $= \text{Rs.}(938.4 + 14.08 + 19.04 + 25.00 + 27.50)$

$= \text{Rs.}1024$ Ans.

Q.7- The gross monthly pay of a person is Rs.75,000. If Rs.1500, Rs.1200 and Rs.1800 are deducted as income tax, benevolent find and G.P fund respectively, and then calculate the net take home salary of the person.

Solution:-

Gross monthly pay = Rs.75000

Deductions = Rs.$(1500 + 1200 + 1800)$

= Rs.4500

Take home salary = Rs.$(75,000 - 4500)$

= Rs.70500 Ans.

MULTIPLE CHOICE QUESTIONS

Tick the best choice.

(i) In Pakistan rate of sales tax is

(a) *15%* *(b)* *16%*

(c) *17%* *(d)* *18%*

(ii) The rate of excise duty is

(a) *50%* *(b)* *100%*

(c) Fixed every year

(d) Different for different items.

(iii) Excise duty on domestic electricity bill is

(a) *1%* *(b)* *1.50%*

(c) *2.00%* *(d)* *2.50%*

(iv) The cost of telephone call depends upon

(a) Length of call

(b) Time of day and day of week

(c) The distance between caller and that being called

(d) All of these

(v) The annual value of a flat is *Rs.1,60,000*. The tax at a rate of *15%* is

(a) *Rs.8,000* (b) *Rs.16,000*
(c) *Rs.24,000* (d) *Rs.25,000*

(vi) *150%* excise duty against the amount of *4,00,000* is

(a) *Rs.4,00,000* (b) *Rs.5,00,000*
(c) *Rs.6,00,000* (d) *Rs.7,00,000*

(vii) *10%* value added tax on the Price of *Rs.15,000* of an article is

(a) *Rs.1400* (b) *Rs.1500*
(c) *Rs.1600* (d) *Rs.1700*

MODEL CLASS TEST

Time : One Hour Max Marks : *25*

Note:- Attempt any four of the following question. (5×4)

Q.1- 750 Calls are made on a telephone. Complete telephone bill including the items.

(a) Call rate Rs.5 per call, CED @15% and W.H Tax @4%.

Q.2- The Price of a bicycle is Rs.3500. If 16% sales tax is charged, then calculate the amount of sales tax on 50 bicycles.

Q.3- If annual income of a Person is Rs.6,25,000. Find the income tax @ 4.5% if Rs.1,50,000 is exempted.

Q.4- The Price of a Car is Rs.5,00,000, 150% excise duty has also been paid. How much had to be Paid to Purchase this car.

Q.5- Noman works 48 hours a week. The basic hourly rate is Rs.50 for 35 hours weekly. Overtime is paid at time and a half. How much does he earn in the week?

◆

UNIT 6 EXPONENTS AND LOGARITHMS

SHORT QUESTIONS

Q.1- What is meant by radical and radicands?

Ans. Let "a" be a real number and "n" be a positive integer then $(a^{1/n})$ may be written as $\sqrt[n]{a}$. Here $\sqrt[n]{a}$ is called radical of index "n" and "a" is called radicand.

Example:-

$a^{1/2} = \sqrt{a}, \sqrt{a}$ is called radical of order 2.

$a^{1/3} = \sqrt[3]{a}, \sqrt[3]{a}$ is called radical of order 3.

Q.2- Define conjugate radicals of order 2?

Ans. $\left(\sqrt{a}+\sqrt{b}\right)$ and $\left(\sqrt{a}-\sqrt{b}\right)$ are conjugate radicals to each other the product of two conjugates is always a rational number.

Q.3- Simplify $x^{1/4} \div x^{2/3}$?

Solution:-

$$x^{1/4} \div x^{2/3} = x^{1/4} \times \frac{1}{x^{2/3}}$$

$$= x^{1/4} \times x^{-2/3}$$

$$= x^{1/4-2/3} = x^{\frac{3-8}{12}}$$

$$= x^{-5/12} = \frac{1}{x^{5/12}}$$

Q.4- Express $\sqrt[n]{27x^{18}}$ in exponential form?

Solution:-

$$\sqrt[n]{27x^{18}} = \left[27x^{18}\right]^{1/3}$$
$$= \left[3^3\, x^{18}\right]^{1/3}$$
$$= 3^{3\times 1/3}\, x^{18\times 1/3}$$
$$= 3\,x^6 \text{ Ans.}$$

Q.5- Simplify $\sqrt{18} \times \sqrt[5]{64}$?

Solution:-

$$\sqrt{18} \times \sqrt[5]{64} = (18)^{1/2} \times (64)^{1/5}$$
$$= (9\times 2)^{1/2} \times (2\times 32)^{1/5}$$
$$= (3^2 \times 2)^{1/2} \times (2\times 2^5)^{1/5}$$
$$= 3^{2\times 1/2} \times 2^{1/2} \times 2^{1/5} \times 2^{5\times 1/5}$$
$$= 3 \times 2^{1/2+1/5} \times 2$$
$$= 6 \times 2^{5+2/10}$$
$$= 6 \times 2^{7/10} = 6 \times \sqrt[10]{2^7}$$
$$= 6 \times \sqrt[10]{128} \text{ Ans.}$$

Q.6- What are the laws of exponents?

Ans. There are four laws of exponents.

(i) Law of Sum of Power:-

It states that $a^m \times a^n = a^{m+n}$ where $a \neq 0, m, n, a \in R$.

(ii) Law of Subtraction of Power:-

$$\frac{a^m}{a^n} = a^{m-n} \text{ where } a \neq 0, a, m, n, a \in R.$$

(iii) Law of Power of Product:-

It states that:

(i) $(a\,b)^n = a^n\, b^n$

(ii) $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$

Where $a, b \neq 0$ and $a, b, n \in R$.

(iv) *Law of Power of Power:-*

It states that:

$(a^m)^n = a^{m\times n}$

Where $a \neq 0, a, m, n \in R$.

Q.7- What do you mean by scientific notation?

Ans. To express extra ordinary large or small numbers, we use scientific notation. In this method any number can be written as theproduct of two numbers. One of them is in between 1 and 10 and the second is positive or negative integral power of 10.i.e.

$a = b\times 10^n$ where $1<b<10$

Example:-

$10000 = 1.0\times 10^4$

$\frac{1}{1000} = 1\times 10^{-3}$

$50,000,000 = 5.0\times 10^7$

Q.8- Define Logarithm of a positive real number.

Ans. Let $a^x = y$. Where $'a, y > 0'$ and $a \neq 0$

This exponential form of an equation may be written as $\log_a y = x$

(read as "logarithm of $'y'$ to the base $'a'$ is equal to $'x'$")

$a^x = y \Leftrightarrow \log_a y = x$

Q.9- Write a note on Common Logarithm.

Ans. Logarithm with base 10 is called Common Logarithm.

(Note : $\log_{10} a$ is written as $\log a$, no need to write 10 as base)

We have $10^1 = 10 \Leftrightarrow \log 10 = 1$

$10^2 = 100 \Leftrightarrow \log 100 = 2$

$10^{-1} = \frac{1}{10} \Leftrightarrow \log \frac{1}{10} = -1$

Q.10- Solve the equation. $\log(x+3)=2$

Solution:-

$$\log(x+3)=2$$
$$\Rightarrow x+3=10^2$$
$$\Rightarrow x+3=100$$
$$\Rightarrow x=100-3$$
$$\Rightarrow \boxed{x=97}\ \text{Ans.}$$

Q.11- Define characteristics of a number.

Ans. To find the characteristics of a number 'x' we write it in scientific form $x=a\times 10^p$

Then 'p' is called characteristics of 'x'

Q.12- Add $\bar{1}.3612$, 3.1946, $\bar{2}.0018$ and $\bar{3}.4619$

Ans. $\bar{1}.3612+3.1946+\bar{2}.0018+\bar{3}.4619$

$$=-1+0.3612+3+0.1946-2+0.0018-3+0.4619$$
$$=-1+3-2-3+0.3612+0.1946+0.0018+0.4619$$
$$=-3+1.0195=-3+1+0.0195$$
$$=-2+0.0195=\bar{2}.0195\ \text{Ans.}$$

Q.13- What are Laws of Logarithm?

Ans. There are three laws of Logarithm:

(i) $\log_a(mn)=\log_a m+\log_a n$

(ii) $\log_a\left(\frac{m}{n}\right)=\log_a m-\log_a n$

(iii) $\log_a(m)^n=n\log_a m$

Q.14- Define Antilogarithm of a real number.

Ans. The inverse function of logarithm is called antilogarithm.

$$\log m=n\Rightarrow m=\text{Antilog } n$$

we have

$$\log 1000=3\Rightarrow \text{Antilog } 3=1000$$

SOLUTION OF EXERCISES

EXERCISE 6.1

Q.1- Determine the radicals and radicands from the following:

(i) $\sqrt{3}$ *(ii)* $4+3\sqrt{3}$ *(iii)* $\sqrt{11}$ *(iv)* $8-2\sqrt{6}$ *(v)* $\frac{\sqrt{5}}{7}$ *(vi)* $\frac{9}{\sqrt{13}}$

Ans.

(i) $\sqrt{3} \Rightarrow \text{Radical} = \sqrt{3}, \ \text{Radicand} = 3$

(ii) $4 + 3\sqrt{a} \Rightarrow \text{Radical} = \sqrt{a}, \ \text{Radicand} = a$

(iii) $\sqrt{11} \Rightarrow \text{Radical} = \sqrt{11}, \ \text{Radicand} = 11$

(iv) $8 - 2\sqrt{6} \Rightarrow \text{Radical} = \sqrt{6}, \ \text{Radicand} = 6$

(v) $\frac{\sqrt{5}}{7} \Rightarrow \text{Radical} = \sqrt{5}, \ \text{Radicand} = 5$

(vi) $\frac{9}{\sqrt{13}} \Rightarrow \text{Radical} = \sqrt{13}, \ \text{Radicand} = 13$

Q.2- Express the following in exponential form:

(i) $\sqrt{a^3}$ *(ii)* $\sqrt[5]{a^3}$ *(iii)* $\frac{1}{\sqrt[p]{a^k}}$ *(iv)* $\frac{1}{\sqrt[b]{a^k}}$

Ans.

(i) $\sqrt{a^3} = (a^3)^{1/2} = (a^{3\times 1/2}) = a^{3/2}$

(ii) $\sqrt[5]{a^3} = (a^3)^{1/5} = (a^{3\times 1/5}) \ a^{3/5}$

(iii) $\frac{1}{\sqrt[p]{a^k}} = \frac{1}{(a^k)^{1/p}} = \frac{1}{(a^{k\times 1/p})} = \frac{1}{(a^{k/p})} = a^{-k/p}$

(iv) $\frac{1}{\sqrt[b]{a^k}} = \frac{1}{(a^k)^{1/b}} = \frac{1}{(a^{k\times 1/b})} = \frac{1}{(a^{k/b})} = a^{-k/b}$

Q.3- Write in the radical form and evaluate the result.

***(i)* $(25)^{1/2}$ *(ii)* $(64)^{1/3}$ *(iii)* $(81)^{1/4}$ *(iv)* $(27)^{1/3}$**

***(v)* $(27)^{2/3}$ *(vi)* $8^{-1/3}$ *(vii)* $(1000)^{2/3}$ *(viii)* $(64)^{1/2}$**

Solution:-

(i) $(25)^{1/2} = \sqrt{25} = \sqrt{5^2} = 5$ Ans.

(ii) $(64)^{1/3} = \sqrt[3]{64} = \sqrt[3]{(4)^3} = 4$ Ans.

(iii) $(81)^{1/4} = \sqrt[4]{81} = \sqrt[4]{(3)^4} = 3$ Ans.

(iv) $(27)^{1/3} = \sqrt[3]{27} = \sqrt[3]{3^3} = 3$ Ans.

(v) $(27)^{2/3} = \left[(27)^2\right]^{1/3} = \sqrt[3]{(27)^2} = \sqrt[3]{(3^3)^2} = \sqrt[3]{(3^2)^3} = 3^2 = 9$ Ans.

(vi) $8^{-1/3} = \sqrt[3]{8^{-1}} = \sqrt[3]{\frac{1}{8}} = \sqrt[3]{\left(\frac{1}{2}\right)^3} = \frac{1}{2}$ Ans.

(vii) $(1000)^{2/3} = \left[(1000)^2\right]^{1/3} = \sqrt[3]{(1000)^2} = \sqrt[3]{(10^3)^2}$

$= \sqrt[3]{(10^2)^3} = 10^2 = 100$ Ans.

(viii) $(64)^{1/2} = \sqrt{64} = \sqrt{8^2} = 8$ Ans.

Q.4- Simplify and answer in exponential form.

(i) $\sqrt{a^{16}}$ **(ii)** $\sqrt[3]{a^{15}}$ **(iii)** $\sqrt[3]{27a^9}$ **(iv)** $\sqrt[3]{8a^9}$ **(v)** $\sqrt[4]{x^{32}}$

(vi) $\sqrt[4]{81x^{20}}$ **(vii)** $\sqrt[3]{125x^9y^{15}}$ **(viii)** $\sqrt{(8+y)^7}$ **(ix)** $\sqrt[4]{16x^2y^6}$

(x) $\sqrt[4]{\frac{x^5y^6}{z^2}}$ **(xi)** $\sqrt[4]{\frac{8x}{x+y}}$ **(xii)** $\sqrt[p]{\frac{y^n}{a^m}}$

Solution:- (i) $\sqrt{a^{16}} = (a^{16})^{1/2} = a^{16\times1/2} = a^8$ Ans.

(ii) $\sqrt[3]{a^{15}} = (a^{15})^{1/3} = a^{15\times1/3} = a^5$ Ans.

(iii) $\sqrt[3]{27a^9} = (27a^9)^{1/3} = (3^3a^9)^{1/3} = 3^{3\times1/3}a^{9\times1/3} = 3a^3$ Ans.

(iv) $\sqrt[3]{8a^9} = (2^3a^9)^{1/3} = 2^{3\times1/3}a^{9\times1/3} = 2a^3$ Ans.

(v) $\sqrt[4]{x^{32}} = (x^{32})^{1/4} = x^{32\times1/4} = x^8$ Ans.

(vi) $\sqrt[4]{81x^{20}} = (3^4x^{20})^{1/4} = 3^{4\times1/4}x^{20\times1/4} = 3x^5$ Ans.

(vii) $\sqrt[3]{125x^9y^{15}} = (5^3x^9y^{15})^{1/3} = 5x^{3\times1/3}x^{9\times1/3}y^{15\times1/3} = 5x^3y^5$ Ans.

(viii) $\sqrt{(8+y)^7} = \left[(8+y)^7\right]^{1/2} = (8+y)^{7\times1/2} = (8+y)^{7/2}$ Ans.

(ix) $\sqrt[4]{16x^2y^6} = (2^4x^2y^6)^{1/4} = 2^{4\times1/4}x^{2\times1/4}y^{6\times1/4} = 2x^{1/2}y^{3/2}$ Ans.

(x) $\sqrt[4]{\frac{x^5y^6}{z^2}} = \left(\frac{x^5y^6}{z^2}\right)^{1/4} = \left(\frac{x^{5\times1/4}y^{6\times1/4}}{z^{2\times1/4}}\right) = \frac{x^{5/4}y^{3/2}}{z^{1/2}}$ Ans.

(xi) $\sqrt[3]{\frac{8x}{x+y}} = \left(\frac{8x}{x+y}\right)^{1/3} = \left(\frac{2^3x}{x+y}\right)^{1/3} = \frac{2^{3\times1/3}x^{1/3}}{(x+y)^{1/3}} = \frac{2x^{1/3}}{(x+y)^{1/3}}$

(xii) $\sqrt[p]{\frac{y^n}{a^m}} = \left(\frac{y^n}{a^m}\right)^{1/p} = \frac{y^{n\times1/p}}{a^{m\times1/p}} = \frac{y^{n/p}}{a^{m/p}}$ Ans.

Q.5- Simplify.

(i) $\sqrt{3} \times \sqrt{7}$ *(ii)* $\sqrt[5]{4} \times \sqrt[5]{128}$ *(iii)* $\sqrt[5]{81} \times \sqrt[5]{27}$ *(iv)* $\sqrt{2} \div \sqrt[9]{32}$
(v) $\sqrt[5]{118} \div \sqrt[5]{2}$ *(vi)* $\sqrt{27} \div \sqrt{81}$ *(vii)* $a^{1/4} \times a^{2/3}$ *(viii)* $x^{6/7} \times y^{1/4}$
(ix) $(x^{3/4} y^{1/6})^6$ *(x)* $(x^3 y^2)^{1/2} \times (y^3 y^3)^{-1/3}$
(xi) $(x^2 y^2)^{1/4} \times (x^{1/3} y)^{1/4}$ *(xii)* $(a^{1/4} b^{1/3})^{-1/2} \div (a^{1/3} b^{1/4})^{-5}$
(xiii) $(x^2 y^3)^{1/5} \times (x^{1/3} y^2)^{1/4}$

Solution:-

(i)
$$\sqrt{3} \times \sqrt{7} = (3)^{1/2} \times (7)^{1/2}$$
$$= (3 \times 7)^{1/2} = (21)^{1/2} = \sqrt{21} \text{ Ans.}$$

(ii)
$$\sqrt[5]{4} \times \sqrt[5]{128} = (4)^{1/5} \times (128)^{1/5}$$
$$= (4 \times 128)^{1/5} = (512)^{1/5} = \sqrt[5]{512} \text{ Ans.}$$

(iii)
$$\sqrt[5]{81} \times \sqrt[5]{27} = (81)^{1/5} \times (27)^{1/5}$$
$$= (81 \times 27)^{1/5}$$
$$= (2187)^{1/5} = \sqrt[5]{2187} \text{ Ans.}$$

(iv)
$$\sqrt{2} \div \sqrt[9]{32} = (2)^{1/2} \div (32)^{1/9}$$
$$= \frac{2^{1/2}}{(32)^{1/9}} = \frac{2^{1/2}}{(2^5)^{1/9}}$$
$$= \frac{2^{1/2}}{2^{5/9}} = 2^{(1/2 - 5/9)}$$
$$= 2^{9 - 10/18} = 2^{-1/8} = (2^{-1})^{1/18}$$
$$= \sqrt[18]{\frac{1}{2}} \text{ Ans.}$$

(v)
$$\sqrt[5]{118} \div \sqrt[5]{2} = \frac{(118)^{1/5}}{(2)^{1/5}}$$
$$= \left(\frac{118}{2}\right)^{1/5} = (59)^{1/5} = \sqrt[5]{59} \text{ Ans.}$$

(vi)
$$\sqrt{27} \div \sqrt{81} = \frac{(27)^{1/2}}{(81)^{1/2}} = \left(\frac{27}{81}\right)^{1/2}$$
$$= \left(\frac{1}{3}\right)^{1/2} = \sqrt{\frac{1}{3}} \text{ Ans.}$$

(vii) $a^{1/4} \times a^{2/3} = a^{1/4+2/3} = a^{3+8/12} = a^{11/12}$

$= \sqrt[12]{a^{11}}$ Ans.

(viii) $x^{6/7} \times y^{1/4} = x^{24/7 \times 1/4} \times y^{1/4}$

$= \left[x^{24/7} \times y\right]^{1/4} = \left[x^{24/2} \times y\right]^{1/4} = \sqrt[4]{x^{24/7}y}$ Ans.

(ix) $(x^{3/4} y^{1/6})^6 = x^{3/4\times 6} y^{1/6\times 6} = x^{9/2} y = y\sqrt{x^9}$ Ans.

(x) $(x^3 y^2)^{1/2} \times (y^3 x^4)^{-1/3} = x^{3\times 1/2} y^{2\times 1/2} \times y^{3\times -1/3} x^{4\times -1/3}$

$= x^{3/2} y^1 \times y^{-1} x^{-4/3} = x^{3/2-4/3} y^{1-1}$

$= x^{1/6} y^0 = x^{1/6} = \sqrt[6]{x}$ Ans.

(xi) $(x^3 y^2)^{1/4} \times (x^1 y^3)^{1/4} = x^{3/4} y^{2/4} \times x^{1/4} y^{3/4}$

$= x^{3/4+1/4} y^{2/4+3/4} = x\, y^{5/4}$

$= (x^4)^{1/4} (y^5)^{1/4} = \sqrt[4]{x^4 y^5}$ Ans.

(xii) $(a^{1/4} b^{1/3})^{-1/2} \div (a^{1/3} b^{1/4})^{-5}$

$$= \frac{1}{(a^{1/4} b^{1/3})^{+1/2}} \div \frac{1}{(a^{1/3} b^{1/4})^5}$$

$$= \frac{1}{a^{1/4\times 1/2} b^{1/3\times 1/2}} \times \frac{a^{1/3\times 5} b^{1/4\times 5}}{1}$$

$$= \frac{a^{5/3} b^{5/4}}{a^{1/8} b^{1/6}} = a^{5/3-1/8} b^{5/4-1/6} = a^{32/24} b^{13/12}$$

$= a^{32/24} b^{26/24} = \sqrt[24]{a^{32} b^{26}} = \sqrt[12]{a^{16} b^{15}}$ Ans.

(xiii) $(x^2 y^3)^{1/5} \times (x^{1/3} y^2)^{1/4}$

$= x^{2/5} y^{3/5} \times x^{1/12} y^{2/4} = x^{2/5+1/12} y^{3/5+2/4}$

$= x^{29/60} y^{11/10}$ Ans.

EXERCISE 6.2

Q.1- Write the base and exponent in the following.

(i) $16x^3$ (ii) x^9 (iii) $(4y)^3$

(iv) $(x-2)^3$ (v) $18x^5$ (vi) $5x^{3/2} \times x^{1/2}$

Solution:-

(i) $16x^3$, *Base* $= x$ *and Exponent* $= 3$.

(ii) x^9, *Base* $= x$ *and Exponent* $= 9$.

(iii) $(4y)^3$, Base = $4y$, Exponent = 3.

(iv) $(x-2)^3$, Base = $x-2$, Exponent = 3.

(v) $18x^5$, Base = x, Exponent = 5.

(vi) $5x^{3/2}\times x^{1/2} = 5x^{3/2+1/2} = 5x^2$ Base = x, Exponent = 2.

Q.2- $\sqrt{(a^2b^3)^6} = \left[(a^2b^3)^6\right]^{1/2}$

$$= (a^2b^3)^{6\times1/2} = (a^2b^3)^3 = a^{2\times3}b^{3\times3} = a^6b^9 \text{ Ans.}$$

Q.3- $\sqrt[9]{(x^{-4}y^3)^{-3}} = \left[(x^{-4}y^3)^{-3}\right]^{1/9}$

$$= (x^{-4}y^3)^{-3\times1/9} = (x^{-4}y^3)^{-1/3}$$

$$= x^{-4\times-1/3}y^{3\times-1/3} = x^{4/3}y^{-1} = \frac{x^{4/3}}{y} \text{ Ans.}$$

Q.4- $(x^ay^{-b})^3\times(x^3y^2)^{-a}$

$$= x^{a\times3}y^{-b\times3}\times x^{3\times(-a)}y^{2\times(-a)}$$

$$= x^{3a}y^{-3b}\times x^{-3a}y^{-2a} = x^{3a-3b}y^{-3b-2a}$$

$$= x^0y^{-(2a+3b)} = \frac{1}{y^{(2a+3b)}} \text{ Ans.}$$

Q.5- $\left(\frac{16x^2}{y^{-2}}\right)^{-1/4} = \left(\frac{2^4x^2}{y^{-2}}\right)^{-1/4}$

$$= \frac{2^{4\times-1/4}x^{2\times-1/4}}{y^{-2\times-1/4}} = \frac{2^{-1}x^{-1/2}}{y^{1/2}}$$

$$= \frac{1}{2x^{1/2}y^{1/2}} \text{ Ans.}$$

Q.6- $\left(\frac{27x^3}{8a^{-3}}\right)^{-2/3} = \left(\frac{3^3x^3}{2^3a^{-3}}\right)^{-2/3} = \frac{3^{3\times-2/3}x^{3\times-2/3}}{2^{3\times-2/3}a^{-3\times-2/3}}$

$$= \frac{3^{-2}x^{-2}}{2^{-2}a^2} = \frac{2^2}{3^2a^2x^2} = \frac{4}{9a^2x^2} \text{ Ans.}$$

Q.7- $\left(\frac{a^{-1/2}}{4c^2}\right)^{-2} = \frac{a^{-1/2\times(-2)}}{(4)^{-2}c^{2\times(-2)}}$

$$= \frac{a}{4^{-2}c^{-4}} = 4^{+2}ac^4 = 16ac^4 \text{ Ans.}$$

Q.8- $\sqrt{a^{-2}b} \times 3\sqrt{ab^{-3}}$

$$= (a^{-2} b)^{1/2} \times 3(a b^{-3})^{1/2}$$

$$= 3(a^{-2} b \times a b^{-3})^{1/2}$$

$$= 3(a^{-2+1} b^{1-3})^{1/2} = 3(a^{-1} b^{-2})^{1/2}$$

$$= 3\left(\frac{1}{a b^{2}}\right)^{1/2} = \frac{3}{a^{1/2} b^{2\times 1/2}} = \frac{3}{a^{1/2} b} \text{ Ans.}$$

Q.9- $\left(\frac{a^{-3}}{b^{-2/3} c}\right)^{-3/2} \div \frac{a b^{2} c}{a^{2} c}$

$$= \frac{a^{-3\times -3/2}}{b^{-2/3\times -3/2} c^{-3/2}} \times \frac{a^{2} \cancel{c}}{a b^{2} \cancel{c}}$$

$$= \frac{a^{9/2}}{bc^{-3/2}} \times \frac{a}{b^{2}}$$

$$= \frac{a^{9/2+1} c^{3/2}}{b^{1+2}} = \frac{a^{11/2} c^{3/2}}{b^{3}} \text{ Ans.}$$

Q.10- $\frac{(a^{4})^{3} (a^{-1}b)^{10}}{a^{2} b^{7}} = \frac{a^{4\times 3} a^{-1\times 10} b^{1\times 10}}{a^{2} b^{7}}$

$$= \frac{a^{12} a^{-10} b^{10}}{a^{2} b^{7}} = a^{12-10-2}\, b^{10-7}$$

$$= a^{0} b^{3} = 1.b^{3} = b^{3} \text{ Ans.}$$

Q.11- $\frac{(x^{3} y)^{3} (2xy)^{-2}}{4x^{-4} y^{-5}} = \frac{x^{3\times 3} y^{1\times 3} 2^{-2} x^{-2} y^{-2}}{4 x^{-4} y^{-5}}$

$$= \frac{x^{9-2+4}\, y^{3-2+5}}{4 \times 2^{2}}$$

$$= \frac{x^{11} y^{6}}{16} \text{ Ans.}$$

Q.12- $\frac{(a^{-5})^{3} \times (a b)^{15}}{a^{-1} b^{2}} = \frac{a^{-5\times 3} \times a^{15} b^{15}}{a^{-1} b^{2}}$

$$= a^{-15+15+1} \times b^{15-2}$$

$$= a^{1} b^{13} = a b^{13} \text{ Ans.}$$

Q.13- $a^5 b^4 c^2 \div a b c$

$$= \frac{a^5b^4c^2}{abc} = a^{5-1}b^{4-1}c^{2-1}$$

$$= a^4b^3c \text{ Ans.}$$

Q.14- $(2ab^2)^2 (3abc^2)^{-2} \div (ab)^{-4} (bca)^5$

$$= 2^2 a^2 b^{2\times2}(3^{-2} a^{-2} b^{-2} c^{-4}) \div \frac{a^5b^5c^5}{(ab)^4}$$

$$= \frac{4a^2b^4}{3^2 a^2b^2c^4} \times \frac{a^4b^4}{a^5b^5c^5}$$

$$= \frac{4a^{2-2}\,b^{4-2}}{9c^4} \times \frac{1}{a^{5-4}b^{5-4}c^5}$$

$$= \frac{4(1)\,b^2}{9abc^{5+4}} = \frac{4\,b^{2-1}}{9ac^9} = \frac{4\,b}{9ac^9} \text{ Ans.}$$

Q.15- $\frac{2^3 \times 6^5}{3^{-3} \times 4^{-4}} = 2^3 \times 3^3 \times 4^4 \times 6^5$

$$= 2^3 \times 3^3 \times (2^2)^4 \times (2 \times 3)^5$$

$$= 2^3 \times 3^3 \times 2^{2\times4} \times 2^5 \times 3^5$$

$$= 2^{3+8+5} \times 3^{3+5} = 2^{16} \times 3^8 \text{ Ans.}$$

Q.16- $\frac{2^5 \times 9^{-1}}{27^{-3} \times 8^{-3}} = \frac{2^5 \times 27^3 \times 8^3}{9}$

$$= \frac{2^5 \times (3^3)^3 \times (2^3)^3}{(3)^2}$$

$$= \frac{2^5 \times 3^9 \times 2^9}{3^2}$$

$$= 2^{5+9} \times 3^{9-2} = 2^{14} \times 3^7 \text{ Ans.}$$

Q.17- $(2^{-3} a^4 b)^{-1} \times (4^{-2} b^{-5})$

$$= \frac{1}{2^{-3}a^4b} \times \frac{1}{4^2b^5}$$

$$= \frac{2^3}{4^2a^4b^{1+5}} = \frac{8}{16a^4b^6} = \frac{1}{2a^4b^6} \text{ Ans.}$$

Q.18- $(3^2)^5 \div 9^3 \times 27^{-1}$

$$= \frac{3^{10}}{(3^2)^3 \times \left[(3^3)\right]^{-1}} = \frac{3^{10}}{3^6 \times 3^{-3}} = 3^{10-6+3} = 3^7$$

$$= 2187 \text{ Ans.}$$

Q.19- $\left(\frac{3}{4}\right)^{-2} \div \left(\frac{4}{9}\right)^3 \times \left(\frac{27}{16}\right)^{-1}$

$$= \frac{3^{-2}}{4^{-2}} \div \frac{4^3}{9^3} \times \frac{(27)^{-1}}{(16)^{-1}}$$

$$= \frac{3^{-2}}{4^{-2}} \div \frac{4^3}{9^3} \times \frac{(3^3)^{-1}}{(4^2)^{-1}}$$

$$= \frac{3^{-2}}{4^{-2}} \div \frac{4^3}{3^6} \times \frac{3^{-3}}{4^{-2}}$$

$$= \frac{3^{-2}}{4^{-2}} \times \frac{3^6}{4^3} \times \frac{3^{-3}}{4^{-2}}$$

$$= \frac{3^{-2}+6-3}{4^{-2+3-2}} = \frac{3^1}{4^{-1}}$$

$$= 3 \times 4 = 12 \text{ Ans.}$$

Q.20- $\left(\frac{2}{3}\right)^{-1} \div \left(\frac{4}{9}\right)^{-2} \times 27$

$$= \frac{2^{-1}}{3^{-1}} \div \left(\frac{4^{-2}}{9^{-2}}\right) \times 27 = \frac{3}{2} \times \frac{9^{-2}}{4^{-2}} \times 3^{+3}$$

$$= \frac{3 \times (3^2)^{-2} \times 3^{+3}}{2 \times (2^2)^{-2}} = \frac{3 \times 3^{(2)(-2)} \times 3^{+3}}{2 \times (2^2)^{-2}}$$

$$= \frac{3^{1-4+3}}{2^{1-4}} = \frac{3^{-0}}{2^{-3}} = 1 \times 2^3 = 8 \text{ Ans.}$$

Q.21- $\frac{5^4}{3^7} \times \frac{9^3}{15^3} \div \frac{27}{25}$

$$= \frac{5^4}{3^7} \times \frac{(3^2)^3}{(3 \times 5)^3} \times \frac{25}{27}$$

$$= \frac{5^4}{3^7} \times \frac{3^6}{3^3 \times 5^3} \times \frac{5^2}{3^3}$$

$$= 5^{4+2-3} \times 3^{6-7-3-3} = 5^3 \times 3^{-7}$$

$$= \frac{5^3}{3^7} = \frac{125}{2187} \text{ Ans.}$$

Q.22- $a^{1/2}b^{2/3} \times a^{2/3}b^{1/4} = a^{1/2+2/3}b^{2/3+1/4}$

$$= a^{3+4/6}b^{8+3/12}$$

$$= a^{7/6}b^{11/12} \text{ Ans.}$$

Q.23- $a^{2/3}b^{5/6} \times a^{1/2}b \div (ab)^{1/3}$

$$= a^{2/3+1/2}b^{5/6+1} \div a^{1/3}b^{1/3}$$

$$= \frac{a^{7/6}b^{11/6}}{a^{1/3}b^{1/3}} = a^{7/6-1/3}b^{11/6-1/3}$$

$$= a^{7-2/6}b^{11-2/6} = a^{5/6}b^{3/2} \text{ Ans.}$$

Q.24- $(a^{1/2}\, b^{1/3}\, c^{1/4})^6$

$$= a^{1/2\times6}b^{1/3\times6}c^{1/4\times6} = a^3b^2c^{3/2} \text{ Ans.}$$

Q.25- $(a^{1/2}\, b^{1/3})^{4/3} \div (a^{1/3}\, b^{1/4})^{1/2}$

$$= a^{1/2\times4/3}b^{1/3\times4/3} \div a^{1/3\times1/2}b^{1/4\times1/2}$$

$$= a^{2/3}b^{4/9} \div a^{1/6}b^{1/8} = \frac{a^{2/3}b^{4/9}}{a^{1/6}b^{1/8}}$$

$$= a^{2/3-1/6}b^{4/9-1/8} = a^{4-1/6}b^{32-9/72} = a^{3/6}b^{23/72}$$

$$= a^{1/2}b^{23/72} \text{ Ans.}$$

Q.26- $a^{2/3} \times a^{1/2} \div a^{1/4}$

$$= a^{2/3+1/2} \div a^{1/4} \pm \frac{a^{7/6}}{a^{1/4}} = a^{7/6-1/4}$$

$$= a^{14-3/12} = a^{11/12} \text{ Ans.}$$

Q.27-

(i) $4^{3/5} \times 4^{1/5} = (4)^{3/5+1/5} = 4^{4/5}$

(ii) $2^{1/8} \times 2^{3/8} = 2^{1/8+3/8} = 2^{4/8} = 2^{1/2}$

(iii) $5x^{1/3} \times 2x^{1/5} = 10x^{1/3+1/5} = 10x^{5+3/15} = 10x^{8/15}$

(iv) $x^{3/4} \cancel{\times x^{2/5}} = x^{3/4+2/5} = x^{15+8/20} = x^{23/20}$

(v) $\frac{1}{2}y^{3/7} \times 4y^{2/7} = \frac{1}{2} \times 4y^{3/7+2/7} = 2y^{5/7}$

(vi) $5x^{3/2} \times x^{1/2} = 5x^{3/2+1/2} = 5x^2$

Q.28-

(i) $a^{2/3}b^{3/4} \times a^{1/3}b^{3/4} = a^{2/3+1/3}b^{3/4+3/4} = a^{3/3}b^{6/4} = ab^{3/2}$

(ii) $x^{3/5}y^{2/9} \times x^{1/5}y^{1/3} = x^{3/5+1/5}y^{2/9+1/3} = x^{4/5}y^{5/9}$

(iii) $2ab^{1/3} \times 3a^{3/5}b^{4/5} = 6a^{1+3/5}b^{1/3+4/5} = 6a^{8/5}b^{17/15}$

(iv) $6x^{3/7} \times \frac{1}{3}x^{1/4}y^{2/5} = 2x^{3/7+1/4}y^{2/5} = 2x^{19/28}y^{2/5}$

(v) $x^3y^{1/2}z^{1/3} \times x^{1/6}y^{1/3}z^{1/2} = x^{3+1/6}y^{1/2+1/3}z^{1/3+1/2}$

$= x^{18+1/6}y^{3+2/6}z^{2+3/6} = x^{19/6}y^{5/6}z^{5/6}$

Q.29-

(i) $3^{1/2} \div 3^{1/3} = \frac{3^{1/2}}{3^{1/3}} = 3^{1/2-1/3} = 3^{3-2/6} = 3^{1/6}$

(ii) $\frac{x^{4/5}}{x^{5/9}} = x^{4/5-5/9} = x^{36-25/45} = x^{11/45}$

(iii) $\frac{2x^{3/4}}{4x^{3/5}} = \frac{1}{2}x^{3/4-3/5} = \frac{1}{2}x^{15-12/20} = \frac{1}{2}x^{3/20}$

(iv) $\frac{25y^{3/5}}{20y^{1/4}} = \frac{5}{4}y^{3/5-1/4} = \frac{5}{4}y^{12-5/20} = \frac{5}{4}y^{7/20}$

(v) $x^3y^2 \div x^{4/3}y^{3/5} = \frac{x^3y^2}{x^{4/3}y^{3/5}} = x^{3-4/3}y^{2-3/5} = x^{5/3}y^{7/5}$

(vi) $a^{5/9}b^{2/3} \div a^{2/5}b^{2/5} = \frac{a^{5/9}b^{2/3}}{a^{2/5}b^{2/5}} = a^{5/9-2/5}b^{2/3-2/5}$

$= a^{25-18/45}b^{10-6/15} = a^{7/45}b^{4/15}$

(vii) $10x^{4/5}y \div 5x^{2/3}y^{1/4} = \frac{10x^{4/5}y}{5x^{2/3}y^{1/4}} = 2x^{4/5-2/3}y^{1-1/4}$

$= 2x^{12-10/15}y^{4-1/4} = 2x^{2/15}y^{3/4}$

(viii) $\frac{5a^{3/4}b^{3/5}}{20a^{1/5}b^{1/4}} = \frac{1}{4}a^{3/4-1/5}b^{3/5-1/4} = \frac{1}{4}a^{11/20}b^{7/20}$

EXERCISE 6.3

Write in scientific notation.

Q.1- 0.051

Solution:-

$$0.015 = \frac{51}{1000} = \frac{51}{10} \times \frac{1}{100} = 5.1 \times 10^{-2} \text{ Ans.}$$

Q.2- 89.99

Solution:-

$$89.99 = \frac{8999}{100} = \frac{8999}{1000} \times 10 = 8.999 \times 10^{1} \text{ Ans.}$$

Q.3- 0.424

Solution:-

$$0.424 = \frac{424}{1000} = \frac{424}{100} \times \frac{1}{10} = 4.24 \times 10^{-1} \text{ Ans.}$$

Q.4- 2566324

Solution:-

$$2566324 = \frac{2566324}{1000000} \times 1000000 = 2.566324 \times 10^{6} \text{ Ans.}$$

Q.5- 0.00000075

Solution:-

$$0.00000075 = \frac{75}{100000000} = \frac{75}{10} \times \frac{1}{10000000}$$

$$= 7.5 \times \frac{1}{10^{7}} = 7.5 \times 10^{-7} \text{ Ans.}$$

Write in decimal form.

Q.6- 0.86×10^{-4}

Solution:-

$$0.86 \times 10^{4} = \frac{86}{100} \times 10000 = 86 \times 100 = 8600 \text{ Ans.}$$

Q.7- 1.345×10^{-5}

Solution:-

$$1.345\times10^{-5}=\frac{1345}{1000}\times\frac{1}{10^{5}}=\frac{1345}{1000}\times\frac{1}{100000}$$

$$=\frac{1345}{100000000}=0.00001345 \text{ Ans.}$$

Q.8- 5.1×10^{-9}

Solution:-

$$5.1\times10^{-9}=\frac{51}{10}\times\frac{1}{10^{9}}=\frac{51}{10}\times\frac{1}{1000000000}$$

$$=\frac{51}{10000000000}=0.0000000051$$

Q.9- 0.525×10^{-7}

Solution:-

$$0.525\times10^{-7}=\frac{525}{1000}\times\frac{1}{10^{7}}=\frac{525}{1000}\times\frac{1}{10000000}$$

$$=\frac{525}{10000000000}=0.0000000525 \text{ Ans.}$$

Q.10- 636.5×10^{-6}

Solution:-

$$636.5\times10^{-6}=\frac{6365}{10}\times\frac{1}{10^{6}}=\frac{6365}{10}\times\frac{1}{1000000}$$

$$=\frac{6365}{10000000}=0.0006365 \text{ Ans.}$$

Simplify and write in scientific notation.

Q.11- $\dfrac{0.96\times10^{7}}{2\times10^{4}}$

Solution:-

$$\frac{0.96\times10^{7}}{2\times10^{4}}=0.48\times10^{7-4}=\frac{48}{100}\times10^{3}$$

$$= \frac{48}{10} \times \frac{1}{10} \times 1000 = 4.8 \times 100 = 4.8 \times 10^2 \text{ Ans.}$$

Q.12- $\dfrac{2.61 \times 4 \times 10^8}{10^3}$

Solution:-

$$\frac{2.61 \times 4 \times 10^8}{10^3} = 10.44 \times 10^{8-3} = 10.44 \times 10^5$$

$$= 1.044 \times 10^{5+1} = 1.044 \times 10^6 \text{ Ans.}$$

Q.13- $\dfrac{521 \times 10^3 \times 12}{2 \times 10^2}$

Solution:-

$$\frac{521 \times 10^3 \times 12}{2 \times 10^2} = 521 \times 6 \times 10^{3-2} = 3126 \times 10$$

$$= 31260 = 3.1260 \times 10^4 \text{ Ans.}$$

Q.14- Convert 4.5×10^5cm into meters and write the solution in decimal form.

Solution:-

We know the $100cm = 1m$.

$$So = 4.5 \times 10^5 cm = \frac{4.5 \times 10^5}{100} m.$$

$$= \frac{450000}{100} m. = 4500m \text{ Ans.}$$

Q.15- The radius of earth is 6400km. Convert it into meters and write the solution in scientific nation.

Solution:-

Radius of earth $= 6400\ km$

$= 6400 \times 1000m \quad \because 1km = 1000\ m$

$= 6400000\ m$

$= 6.4 \times 10^6\ m$ Ans.

EXERCISE 6.4

Q.1- Write down the characteristic of the logarithms of the following numbers.

(i) **6350** ***(ii)*** **2035.6** ***(iii)*** **2.057**
(iv) **0.8657** ***(v)*** **0.0732** ***(vi)*** **0.000721**

Solution:-

(i) Characteristic of $6350 = 3$.
(ii) Characteristic of $2035.6 = 3$.
(iii) Characteristic of $2.057 = 0$.
(iv) Characteristic of $0.8657 = -1$.
(v) Characteristic of $0.0732 = -2$.
(vi) Characteristic of $0.000721 = -4$.

Q.2- Write down the values of:

(i) **log 52.13** ***(ii)*** **log 6.304** ***(iii)*** **log 0.6127**
(iv) **log 0.0057** ***(v)*** **log 0.00003**

Solution:-

(i) $\log 52.13 = ?$
Characteristic $= 1$
Mantissa $= .7170$ Ans.
Thus $\log 52.13 = 1.7170$

(ii) $\log 6.304 = ?$
Characteristic $= 0$
Mantissa $= .7996$
Thus $\log 6.304 = 0.7996$ Ans.

(iii) $\log 0.6127 = ?$
Characteristic $= -1$
Mantissa $= .7873$
Thus $\log 0.6127 = \bar{1}.7873$ Ans.

(iv) $\log 0.0057 = ?$
Characteristic $= -3$

Mantissa = .7559

Thus $\log 0.0057 = \bar{3}.7559$ Ans.

(v) $\log 0.00003 = ?$

Characteristic = -5

Mantissa = .4771

Thus $\log 0.00003 = \bar{5}.4771$ Ans.

Q.3- If log 6374 = 3.8044, write down the values of:

***(i)* log 6.374 *(ii)* log 0.6374 *(iii)* log 0.00637**

Solution:-

(i) $\log 6.374 = ?$

As we are given that $\log 6374 = 3.8044$

It shows that for $\log 6.374$

Characteristic = 0

Mantissa = .8044

Thus $\log 6.374 = 0.8044$. Ans.

(ii) $\log 0.374 = ?$

We learn from Part *(i)*

Characteristic = -1

Mantissa = .8044

$\log 0.6374 = \bar{1}.8044$. Ans.

(iii) Similarly

$\log 0.006374 = \bar{3}.8044$. Ans.

Q.4- *(i)* If log x = 2.0374, find x.

***(ii)* If log x = 0.1597, find x.**

***(iii)* If log x = 4.4236, find x.**

Solution:-

(i) $\log x = \bar{2}.0374, x = ?$

$\Rightarrow x =$ Antilog 2.0374

Thus characteristic of $x = -2$

Mantissa of $x = .0374$

Now from antilogarithm table, the number against $.0374$ is 1090. So

$x = \text{Antilog } 2.0374 = 0.01090$ Ans.

(ii) $\log x = 0.1579, x = ?$

$\Rightarrow x = \text{Antilog } 0.1597$

Characteristic of $x = 0$

Mantissa of $x = .1597$

From table of antilogarithm, against $.1597$ is 1444. Thus

$x = \text{Antilog } 0.1597 = 1.444$ Ans.

(iii) $\log x = 4.4236, x = ?$

$\Rightarrow x = \text{Antilog } 4.4236$

Characteristic of $x = 4$

Mantissa of $x = .4236$

From table of antilogarithm. The number again $.4236$ is 2653. Thus

$x = \text{Antilog } 4.4236 = 26530.0$ Ans.

EXERCISE 6.5

Q.1- Solve

Solution:-

(i)
$$\frac{\log 81}{\log 9} = \frac{\log 9^2}{\log 9}$$
$$= \frac{2\log 9}{\log 9} = 2 \text{ Ans.}$$

(ii)
$$\frac{\log 36}{\log 6} = \frac{\log 6^2}{\log 6}$$
$$= \frac{2\log 6}{\log 6} = 2 \text{ Ans.}$$

(iii) $\dfrac{\log 243}{\log 9} = \dfrac{\log 3^5}{\log 3^2}$

$= \dfrac{5\log 3}{2\log 3} = \dfrac{5}{2}$ Ans.

Q.2- Evaluate

Solution:-

(i) $\log 5 + \log 4 + \log 3 - \log 6$

$= \log 5 + \log 2^2 + \log 3 - \log(2\times 3)$

$= \log 5 + 2\log 2 + \cancel{\log 3} - \log 2 - \cancel{\log 3}$

$= \log 5 + \log 2 = \log(5\times 2) = 1$ Ans.

(ii) $\log 5 + \log 20 + \log 24 + \log 25 - \log 60$

$= \log(5\times 20\times 24\times 25) - \log 60$

$= \log\dfrac{5\times \cancel{20}\times \cancel{24}^{8}\times 25}{\cancel{60}} = \log 1000$

$= \log 10^3 = 3\log 10$

$= 3(1) = 3$ Ans.

(iii) $2\log 3 + 3\log 4 + 4\log 5 - 2\log 6$

$= \log 3^2 + \log 4^3 + \log 5^4 - \log 6^2$

$= \log\dfrac{3^2\times 4^3\times 5^4}{6^2}$

$= \log\dfrac{3\times \cancel{2}\times \cancel{4}\times 4\times 4\times 5\times 5\times 5\times 5}{\cancel{6}\times \cancel{6}}$

$= \log(10000) = \log 10^4$

$= 4\log 10 = 4(1)$

$= 4$ Ans.

(iv) $2\log 5 + \log 8 - \dfrac{1}{2}\log 4$

$= \log 5^2 + \log 8 - \log(4)^{1/2}$

$= \log\dfrac{5^2\times 8}{(4)^{1/2}} = \log\dfrac{25\times 8}{2}$

$= \log 100 = \log 10^2$

$= 2\log 10 = 2(1) = 2$ Ans.

(v) $\log 200 + \log 5$

$= \log(200 \times 5) = \log 1000$

$= \log 10^3$

$= 3\log 10 = 3(1) = 3$ Ans.

Q.3- Simplify without using logarithm table.

(i) log 1.3472 + log 22.79 − log 5

(ii) log 22.13 + log 0.354 + log 7 − log 3

(iii) log 57.86 + log 4.385 − log 2.391 − log 3.072

Ans. Solution:-

(i) $\log 1.3472 + \log 22.79 - \log 5$

$= \log\left(\frac{1.3472 \times 22.79}{5}\right)$ Ans.

(ii) $\log 22.13 + \log 0.354 + \log 7 - \log 3$

$= \log\left(\frac{22.13 \times 0.354 \times 7}{3}\right)$ Ans.

(iii) $\log 57.86 + \log 4.385 - \log 2.391 - \log 3.072$

$= \log\left(\frac{57.86 \times 4.385}{2.391 \times 3.072}\right)$ Ans.

Q.4- Solve with the help of logarithm table.

(i) $\frac{2.38 \times 3.901}{4.83}$ **(ii)** $\frac{8.67 \times 3.94}{1.78}$

(iii) $\frac{25.36 \times 3.4569}{9.87 \times 8.93}$

Solution:- Let us suppose that

(i) $x = \frac{2.38 \times 3.901}{4.83}$

Taking log of both sides.

$\log x = \log \frac{2.38 \times 3.901}{4.83}$

Now using laws of logarithm.

$\log x = \log 2.38 + \log 3.901 - \log 4.83$

By using table solve the logarithms.

$\log x = 0.3766 + 0.5912 - 0.6839$

$= 0.9678 - 0.6839$

$\log x = 0.2839$

$x = \text{Antilog } 0.2839$

$x = 1.923$

Thus $\frac{2.38 \times 3.901}{4.83} = 1.923$ Ans.

(ii) Let us suppose that

$$x = \frac{8.67 \times 3.94}{1.78}$$

Taking log of both sides.

$$\log x = \log \frac{8.67 \times 3.94}{1.78}$$

Using laws of logarithm. We get

$\log x = \log 8.67 + \log 3.94 - \log 1.78$

To find the log, using table of logarithm.

$\log x = 0.9380 + 0.5955 - 0.2504$

$= 1.5335 - 0.2504$

$\log x = 1.2831$

$x = \text{Antilog } 1.2831$

$x = 19.19$

Thus $\frac{8.67 \times 3.94}{1.78} = 19.19$ Ans.

(iii) Let us suppose that

$$x = \frac{25.36 \times 3.4569}{9.87 \times 8.93}$$

Taking log of both sides.

$$\log x = \log \frac{25.36 \times 3.4569}{9.87 \times 8.93}$$

Using laws of logarithm.

$\log x = \log 25.36 + \log 3.4569 - \log 9.87 - \log 8.93$

Using logarithm table solve loges.

$\log x = 1.4041 + 0.5387 - 0.9949 - 0.9509$

$\log x = 1.9428 - 1.9452$

$\log x = -0.0024 \quad = -1 + 1 - 0.0024 \quad = -1 + 0.9976$

$\log x = \bar{1}.9976$

$x = Antilog\ \bar{1}.9976 \quad = 0.9945$ Ans.

Q.5- Prove That

(i) $\log\left(\frac{a^2}{bc}\right) + \log\left(\frac{b^2}{ca}\right) + \log\left(\frac{c^2}{ab}\right) = 0$

(ii) $3 \log 2 + 2 \log 3 + \log 5 = \log 360$

(iii) $5 \log 3 - \log 9 = \log 27$

(iv) $\log\left(\frac{75}{16}\right) + \log\left(\frac{32}{243}\right) - 2\log\left(\frac{5}{9}\right) = \log 2$

(v) $2\log\left(\frac{11}{3}\right) + \log\left(\frac{130}{77}\right) - \log\left(\frac{55}{91}\right) = \log 2$

(i) $\log\left(\frac{a^2}{bc}\right) + \log\left(\frac{b^2}{ca}\right) + \log\left(\frac{c^2}{ab}\right) = 0$

L.H.S $= \log\left(\frac{a^2}{bc}\right) + \log\left(\frac{b^2}{ca}\right) + \log\left(\frac{c^2}{ab}\right)$

$= \log 1\left(\frac{a^2 \times b^2 \times c^2}{bc.ca.ab}\right) = \log\left(\frac{a^2b^2c^2}{a^2b^2c^2}\right)$

$= \log 1 = 0 =$ R.H.S.

(ii) $3 \log 2 + 2 \log 3 + \log 5 = \log 360$

L.H.S. $= 3 \log 2 + 2 \log 3 + \log 5$

$= \log 2^3 + \log 3^2 + \log 5 \quad = \log (2^3 \times 3^2 \times 5)$

$= \log (8 \times 9 \times 5) = \log 360 = R.H.S$

(iii) $5\log 3 - \log 9 = \log 27$

$$\text{L.H.S.} = 5\log 3 - \log 9 = \log 3^5 - \log 3^2$$

$$= \log\left(\frac{3^5}{3^2}\right) + \log 3^{(5-2)}$$

$$= \log 3^3 = \log 27 = R.H.S.$$

(iv) $\log\left(\frac{75}{16}\right) + \log\left(\frac{32}{243}\right) - 2\log\left(\frac{5}{9}\right) = \log 2$

$$\text{L.H.S.} = \log\frac{75}{16} + \log\frac{32}{243} - 2\log\frac{5}{9}$$

$$= \log 75 - \log 16 + \log 32 - \log 243 - 2[\log 5 - \log 9]$$

$$= \log(5^2 \times 3) - \log 16 + \log(16 \times 2)$$
$$- \log 3^5 - 2\log 5 + 2\log 3^2$$

$$= \cancel{2\log 5} + \log 3 - \cancel{\log 16} + \cancel{\log 16}$$
$$+ \log 2 - 5\log 3 - \cancel{2\log 5} + 4\log 3$$

$$= \log 2 = \text{R.H.S.}$$

(v) $2\log\left(\frac{11}{13}\right) + \log\left(\frac{130}{77}\right) - \log\left(\frac{55}{91}\right) = \log 2$

$$\text{L.H.S.} = 2[\log 11 - \log 13) + \log 130 - \log 77$$
$$- \log(5 \times 11) + \log(13 \times 7)]$$

$$= \cancel{2\log 11} - \cancel{2\log 13} + \log 2 + \cancel{\log 5} + \cancel{\log 13} - \cancel{\log 7}$$
$$- \cancel{\log 11} - \cancel{\log 5} - \cancel{\log 11} + \cancel{\log 13} + \cancel{\log 7}$$

$$= \log 2 = \text{R.H.S.}$$

Q.6- Show that: $3\log 4 + 2\log 5 - \frac{1}{3}\log 64 - \frac{1}{2}\log 16 = 2$

Solution:-

$$\text{L.H.S.} = 3\log 4 + 2\log 5 - \frac{1}{3}\log 64 - \frac{1}{2}\log 16$$

$$= 3\log 4 + 2\log 5 - \frac{1}{3}\log(4)^3 - \frac{1}{2}\log 4^2$$

$$= 3\log 4 + 2\log 5 - \frac{1}{3}.3\log 4 - \frac{1}{2}.2\log 4$$

$$= 3\log 4 + 2\log 5 - \log 4 - \log 4$$

$$= 3\log 4 - 2\log 4 + \log 5^2$$

$$= \log 4 + \log 25 = \log(4 \times 25)$$

$$= \log 100 = \log 10^2 = 2\log 10 = 2(1) = 2$$

Q.7- Show that: log (1×2×3) = log 1 + log 2 + log 3

Solution:-

$$\log(1 \times 2 \times 3) = \log 1 + \log 2 + \log 3$$

$$\log(6) = \log 1 + \log 2 + \log 3$$

Taking logs

$$0.7782 = 0.0000 + 0.301 + 0.4771$$

$$\Rightarrow 0.7782 = 0.7782$$

L.H.S. = R.H.S.

Q:8- Using logarithmic table evaluate the following:

(i) $69.13 \times 0.34 \times 0.014$ *(ii)* $\dfrac{8.67 \times 3.94}{1.78}$

(iii) $\dfrac{4}{3} \times 3.0142 \times (1.5)^2$ *(iv)* $\dfrac{(23.56)^2 \times (0.4569)}{847.5}$

(v) $\dfrac{0.9876 \times (16.42)^2}{(4.567)^{1/3}}$ *(vi)* $\sqrt{\dfrac{3\sqrt{0.0125} \times \sqrt{31.15}}{0.00081}}$

(vii) $\dfrac{(6.45)^3 \times (0.00034)^{1/3} \times (981.9)}{(9.37)^2 \times (8.93)^{1/4} \times (0.0617)}$

(viii) $\dfrac{(0.0437)^{2/3} \times (1.407)^2}{(0.0015)^{1/3} \times (1.235)^{1/7}}$

Solution:-

(i) Let us suppose that:

$$x = 69.13 \times 0.34 \times 0.014$$

Taking log of both sides.

$$\log x = \log 69.13 + \log 0.34 + \log 0.014$$

$$= 1.8397 + 1.5315 + 2.1461$$
$$= 1.8397 - 1 + 0.5315 - 2 + 0.1461$$
$$= 1.8397 + 0.5315 - 0.1461 - 1 - 2$$
$$= 2.5173 - 3 = -0.4827$$
$$\log x = -1 + 1 - 0.4827 = -1 + 0.5173$$

$\log x = 1.5173$ _

$x =$ Antilog 1.5173

$x = 0.3291$ Ans.

(ii) Let:

$$x = \frac{8.67 \times 3.94}{1.78}$$
$$\log x = \log \frac{8.67 \times 3.94}{1.78}$$
$$= \log 8.67 + \log 3.94 - \log 1.78$$
$$= 0.9380 + 0.5955 - 0.2504$$
$$= 1.5335 - 0.2504$$
$$\log = 1.2831$$

$x =$ Antilog $1.2831 = 19.19$

Thus given expression $= 19.19$ Ans.

(iii) Let:

$$x = \frac{4}{3} \times 3.142 \times (1.5)^3$$
$$\log x = \log\left[\frac{4}{3} \times 3.142 \times (1.5)^3\right]$$
$$= \log 4 + \log 3.142 + 3 \log 1.5 - \log 3$$
$$= 0.6021 + 0.4972 + 3\,(0.1761) - 0.4771$$
$$= 1.0993 + 0.5283 - 0.4771$$
$$= 1.6276 - 0.4771$$
$$\log x = 1.1505$$

$x =$ Antilog $1.1505 = 17.75$

Thus given expression $= 17.75$ Ans.

(iv) Let:

$$x = \frac{(25.36)^2 \times (0.4569)}{847.5}$$

$$\log x = \log \frac{(25.36)^2 \times (0.4569)}{847.5}$$

$$= 2 \log 25.36 + \log 0.4569 - \log 847.5$$

$$= 2\ (1.4041) + (1.6599) - 2.9282$$

$$\log x = 2.8082 - 1 + 0.6599 - 2.9282$$

$$= 3.4681 - 3.9282 \ = - 0.4601$$

$$\log x = - 1 + 1 - 0.4601$$

$$= - 1 + 0.5399 = 1.5399$$

$$\log x = 1.5399$$

$$x = \text{Antilog } 1.5399$$

$$x = 0.3466$$

Thus given expression = 0.3466 Ans.

(v) Let:

$$x = \frac{0.9876 \times (16.42)^2}{(4.567)^{1/3}}$$

Taking log of both sides.

$$\log x = \log \frac{0.9876 \times (16.42)^2}{(4.567)^{1/3}}$$

$$= \log 0.9876 + 2 \log 16.42 - \frac{1}{3} \log 4.576$$

$$\log x = \bar{1}.9946 + 2[1.2153] - \frac{1}{3}(0.6597)$$

$$= - 1 + 0.9946 + 2.4306 - 0.2199$$

$$= 3.4252 - 1.2199$$

$$\log x = 2.2053$$

$$x = \text{Antilog } 2.2053 = 160.4$$

Thus given expression = 160.4 Ans.

(vi) Let:

$$x = \sqrt{\frac{3\sqrt{0.0125} \times \sqrt{31.15}}{0.00081}}$$

$$\log x = \log\left[\frac{3(0.0125)^{1/2} \times (0.0125)^{1/2}}{0.00081}\right]^{1/2}$$

$$\log x = \frac{1}{2}[\log 3 + \log(0.0125)^{1/2} + \log(31.15)^{1/2} - \log(0.00081)]$$

$$= \frac{1}{2}[\log 3 + \frac{1}{2}\log 0.0125 + \frac{1}{2}\log 31.15 - \log 0.00081]$$

$$= \frac{1}{2}[0.4771 + \frac{1}{2}(\bar{2}.0969) + \frac{1}{2}(1.4935) - (\bar{4}.9085)]$$

$$= \frac{1}{2}[0.4771 + \frac{1}{2}(-2 + 0.0969) + \frac{1}{2}(1.4935) - (-4 + 0.9085)]$$

$$= \frac{1}{2}[0.4771 - 1 + 0.0485 + 0.7467 + 4 - 0.9085]$$

$$= \frac{1}{2}[+3 + 1.2713 - 0.9085]$$

$$= \frac{1}{2}[3.3628] = 1.6814$$

$\log x = 1.6814$

$x =$ Antilog 1.6814

$x = 48.01$

Thus given expression = 48.01 Ans.

(vii) Let:

$$x = \frac{(6.45)^3 \times (0.00034)^{1/3} \times (981.9)}{(9.37)^2 \times (8.93)^{1/4} \times (0.0617)}$$

$$\log x = \log \frac{(6.45)^3 \times (0.00034)^{1/3} \times (981.9)}{(9.37)^2 \times (8.93)^{1/4} \times (0.0617)}$$

$$= 3\log 6.45 + \frac{1}{3}\log 0.00034 + \log 981.9$$

$$- 2\log 9.37 - \frac{1}{4}\log 8.93 - \log 0.0617$$

$$= 3(0.8096) + \frac{1}{3}(\bar{4}.5315) + 2.9921 - 2(0.9717)$$

$$-\frac{1}{4}(0.9509) - \bar{2}.7903$$

$$= 2.4288 + \frac{1}{3}(-4 + 0.5315) + 2.9921 - (1.9434)$$

$$-0.2377 - [2 + 0.7903]$$

$$= 2.4288 + \frac{1}{3}(-3.4685) + 2.9921 - 1.9434 - 0.2377$$

$$+ 2 - 0.7903$$

$$= 2.4288 - 1.1568 + 2.9921 - 1.9434 - 0.2377$$

$$+ 2 - 0.7903$$

$$= 7.4209 - 4.1276 = 3.2933$$

$\log x = 3.2933$

$x =$ Antilog $3.2933 = 1964.00$

Thus given expression = *1964.00* Ans.

(viii) Let:

$$x = \frac{(0.0437)^{2/3} \times (1.407)^2}{(0.0015)^{1/3} \times (1.235)^{1/7}}$$

$$\log x = \log \frac{(0.0437)^{2/3} \times (1.407)^2}{(0.0015)^{1/3} \times (1.235)^{1/7}}$$

$$= \log(0.0437)^{2/3} + \log(1.407)^2 - \log(0.0015)^{1/3} - \log(1.235)^{1/7}$$

$$= \frac{2}{3}\log(0.0437) + 2\log 1.407 - \frac{1}{3}\log(0.0015) - \frac{1}{7}\log(1.235)$$

$$= \frac{2}{3}(\bar{2}.6405) + 2(0.1483) - \frac{1}{3}(\bar{3}.1761) - \frac{1}{7}(0.0917)$$

$$=\frac{2}{3}(-2+0.6405)+0.2966-\frac{1}{3}(-3+0.1761)-0.0131$$

$$=\frac{2}{3}(-1.3595)+0.2966+1-0.0587-0.0131$$

$$=2(-0.4532)+1.2966-0.0718$$

$$=-0.9064+1.2966-0.0718$$

$$=1.2966-0.9782=0.3184$$

$$\log x=0.3184$$

$x =$ Antilog $0.3184 = 2.082$

Thus given expression = 2.082 Ans.

Q.9- If $v=\sqrt{\frac{g\ell}{2\pi}}$ find v. When $\ell = 150$, g = 32.16, $\pi = 3.142$.

Solution:-

As $\ell = 150, g = 32.16, \pi = 3.142.$

and $v=\sqrt{\frac{g\ell}{2\pi}}$

So $v=\sqrt{\frac{32.16\times 150}{2\times 3.142}}$

$$\log v=\log\left(\frac{32.16\times 150}{6.284}\right)^{1/2}$$

$$=\frac{1}{2}[\log 32.16+\log 150-\log 6.284]$$

$$=\frac{1}{2}(1.5073+2.1761-0.7983)$$

$$=\frac{1}{2}(3.6834-0.7983)$$

$$\log v=\frac{1}{2}(2.8851)=1.4426$$

$v =$ Antilog $1.4426 = 27.71$ Ans.

Q.10- If $H = \dfrac{I^2 Rt}{4.2}$, when I = 1.3, R = 6.7, and t = 25

Solution:-

As $I = 1.3, R = 6.7$ and $t = 2.5$

So. $H = \dfrac{I^2 Rt}{4.2}$

$$H = \frac{(1.3)^2 \times 6.7 \times 25}{4.2}$$

$$log\ H = log\left(\frac{(1.3)^2 \times 6.7 \times 25}{4.2}\right)$$

$$= log\ (1.3)^2 + log\ 6.7 + log\ 25 - log\ 4.2$$

$$= 2\ log\ 1.3 + log\ 6.7 + log\ 25 - log\ 4.2$$

$$= 2[0.1139] + 0.8216 + 1.3979 - 0.6232$$

$$= 0.2278 + 0.8216 + 1.3979 - 0.6232$$

$$= 2.4473 - 0.6232 = 1.8241$$

$$log\ H = 1.8241$$

H = Antilog $1.8241 = 66.70$ Ans.

Q.11- Find *h*, if $h = \dfrac{v}{\pi(R^2 - r^2)}$, when $v = 1190$, $R = 83.6$, r = 62.4, and π = 3.14.

Solution:- We are given that

$v = 1190, R = 83.6\ r = 262.4\ and\ \pi = 3.14$

So $h = \dfrac{v}{\pi(R^2 - r^2)}$

$$h = \frac{1190}{3.14\left((83.4)^2 - (62.4)^2\right)}$$

$$log\ h = log\frac{1190}{3.14(6955.56 - 3893.76)}$$

$$= log\frac{1190}{3.14 \times 3061.80}$$

$= \log 1190 - \log 3.14 - \log 3061.80$

$= 3.0755 - 0.4969 - 3.4858$

$= 3.0755 - 3.9827 = - 0.9082$

$= - 1 + 1 - 0.9082 \quad = - 1 + 0.0918 = \bar{1}.0918$

$h =$ Antilog $\bar{1}.0918 = 0.1235$ Ans.

Review Exercise-6

Q.1- Encircle the correct answer.

(i) $\sqrt{3}$ is:

(a) a rational number (b) an irrational number

(c) a natural number (d) an integer

(ii) $\sqrt[3]{7}$ is called:

(a) radical (b) radicand

(c) rational number (d) integer

(iii) In $\sqrt{3}$, 3 is called.

(a) radical (b) radicand

(c) integer (d) natural number

(iv) In a^n, n is called

(a) radical (b) radicand

(c) exponent (d) base

(v) In 4^5, 4 is called

(a) base (b) exponent

(c) integer (d) radical

(vi) The logarithm calculated to the base "10" is called

(a) mantissa (b) common logarithm

(c) characteristic (d) natural number

(vii) In the logarithm of a number the integral part is called.

(a) characteristic (b) mantissa

(c) decimal part (d) real part

(viii) In the logarithm of a number the decimal part is called

(a) characteristic (b) mantissa

(c) rational number (d) real part

(ix) $\sqrt{\sqrt{2}} = ?$

(a) base *(b)* exponent

(c) integer *(d)* radical

(x) $\sqrt{2+\sqrt{3}}$ is not radical, because $2+\sqrt{3}$ is:

(a) irrational *(b)* rational

(c) integer *(d)* exponent

Ans.

(i) (b)	*(ii) (a)*	*(iii) (b)*	*(iv) (c)*	*(v) (a)*	*(vi) (b)*
(vii) (a)	*(viii) (b)*	*(ix) (d)*	*(x) (a)*		

Q.2- Fill in the blanks.

(i) If $\sqrt[n]{a}$ is irrational, where "a" is rational, then $^n\sqrt{a}$ is called________.

(ii) The symbol $\sqrt[n]{}$ is called________.

(iii) In 3^5, 5 is called the________.

(iv) In a^n, "a" is called the________.

(v) The logarithm calculated to the base 10 is called____.

(vi) The logarithm of a number consists of two parts, the integral part is called________.

(vii) In the logarithm of a number the decimal part is called________.

Ans.

(i) Radical	*(ii)* Radical sign	*(iii)* Exponent	*(iv)* Base
*(v)*Common logarithm	*(vi)*Characteristic	*(vii)*Mantissa	

Q.3- Simplify:

(i) $(x^5y^3)^{1/2} \times (y^7x^3)^{-1/3}$ **(ii)** $(a^{1/4}b^{1/3})^{-1/2} \div (a^{1/3}b^{1/4})^{-3}$

Solution:- We are given that

(i) $(x^5y^3)^{1/2} \times (y^7x^3)^{-1/3}$

$$= x^{5\times 1/2}y^{5\times 1/2} \times x^{5\times\frac{-1}{3}}x^{3/2-\frac{7}{3}}$$

$$= x^{5/2}y^{3/2}\times y^{-7/3}x^{-1} = x^{\frac{5}{2}-1}\times x^{3/2-\frac{7}{3}}$$

$$= x^{3/2}y^{-5/6}\ Ans.$$

(ii) $(a^{1/4}b^{1/3})^{-1/2}\div(a^{1/3}b^{1/4})^{-3}$

$$= \frac{1}{(a^{1/4}b^{1/3})^{1/2}}\div\frac{1}{(a^{1/3}b^{1/4})^{3}}$$

$$= \frac{1}{(a^{1/4\times 1/2}b^{1/3\times 1/2})}\times a^{1/3\times 3}b^{1/4\times 3} = \frac{a\,b^{3/4}}{a^{1/8}b^{1/6}}$$

$$= (a^{1-1/8}b^{3/4-1/6}) = a^{7/8}b^{7/12}\ \text{Ans.}$$

Q.4- Evaluate:

(i) $x^{2/3}y^{5/8}\times y^{1/2}\div(xy)^{1/3}$ **(ii)** $\left(\frac{2}{5}\right)^{-1}\div\left(\frac{4}{25}\right)\times 625$

Solution:-

(i) $x^{2/3}y^{5/8}\times y^{1/2}\div(xy)^{1/3}$

$$= \frac{x^{2/3}y^{5/8+1/2}}{(x\,y)^{1/3}} = \frac{x^{2/3}y^{9/8}}{x^{1/3}y^{1/3}}$$

$$x^{2/3-1/3}y^{9/8-1/3} = x^{1/3}y^{19/24}\ \text{Ans.}$$

(ii) $\left(\frac{2}{5}\right)^{-1}\div\left(\frac{4}{25}\right)\times 625$

$$= \frac{5}{2}\div 4\times 25 = \frac{5}{2}\div 100$$

$$= \frac{5}{2}\times\frac{1}{100} = \frac{1}{2}\times\frac{1}{20} = \frac{1}{40}\ \text{Ans.}$$

Q.5- Show that $\log\frac{(3\times 4\times 5)}{7} = \log 3+\log 4+\log 5-\log 7$

Solution:-

$$\log\frac{(3\times 4\times 5)}{7} = \log 3+\log 4+\log 5-\log 7$$

$$\Rightarrow \log\frac{(60)}{7} = \log 3+\log 4+\log 5-\log 7$$

$$\Rightarrow \log 8.571 = \log 3 + \log 4 + \log 5 - \log 7$$

Solving the logs.

$$\Rightarrow 0.9331 = 0.4771 + 0.6021 + 0.6990 - 0.8451$$

$$\Rightarrow 0.9331 = 1.7782 - 0.8451$$

$$0.9331 = 0.9331$$

$$L.H.S = R.H.S$$

Q.6- **Use logarithmic table to evaluate:**

(i) $\mathbf{62.14 \times 0.32 \times 0.015}$

(ii) $\mathbf{\dfrac{3.64 \times 3.94}{2.78}}$

(iii) $\mathbf{\dfrac{(13.26)^2 \times (0.4564)}{325.5}}$

Solution:-

Let

(i) $x = 62.14 \times 0.32 \times 0.015$

$$\log x = \log (62.14 \times 0.32 \times 0.015)$$

$$\log x = \log 62.14 \underline{+} \log 0.32 \underline{+} \log 0.015$$

$$= 1.7934 + 1.5051 + 2.1761$$

$$= 1.7934 - 1 + 0.5051 - 2 + 0.1761$$

$$= 1.7934 + 0.5051 + 0.1761 - 3$$

$$= \underline{2}.4746 - 3 \quad = 2 + 0.4746 - 3 \quad = -1 + 0.4746$$

$$\log x = 1.4746 \ \_$$

$$x = \text{Antilog } \bar{1}.4746$$

$$x = 0.2983$$

Thus

$62.14 \times 0.32 \times 0.015 = 0.2983$ Ans.

(ii) Let

$$x = \frac{3.64 \times 3.94}{2.78}$$

$$\log x = \log \frac{3.64 \times 3.94}{2.78}$$

$$\log x = \log 3.64 + \log 3.94 - \log 2.78$$

$$= 0.5611 + 0.5955 - 0.4440$$

$$= 1.1566 - 0.4440$$

$$\log x = 0.7126$$

$$x = \text{Antilog } 0.7126 = 5.158$$

$$x = 5.158$$

Thus given expression = 5.158 Ans.

(iii) Let

$$x = \frac{(13.26)^2 \times (0.4564)}{325.5}$$

$$\log x = \log \frac{(13.26)^2 \times (0.4564)}{325.5}$$

$$= 2 \log 13.26 + \log 0.4564 - \log 325.5$$

$$\log x = 2\,[1.1226] + [1.6594] - 2.5124$$

$$= 2.2452 - 1 + 0.6594 - 2.5124$$

$$= -1 + 2.9046 - 2.5124$$

$$= -1 + 0.3922$$

$$\log x = 1.3922$$

$$x = \text{Antilog } 1.3922$$

$$= 0.2467$$

Thus given expression = 0.2467 Ans.

Multiple Choice Questions

Tick ✔ the Correct Answer.

(i) $\sqrt{a}$ is a radical of order

(a) 1 (b) 2

(c) $\frac{1}{2}$ (d) 3

(ii) $x^{1/4} \div x^{+2/3}$ is equal to

(a) $x^{-5/12}$ (b) $x^{12/5}$

(c) $x^{5/12}$ (d) $x^{-1/7}$

(iii) The product of two conjugate radicals is

(a) an irrational number *(b)* rational

(c) even, *(d)* odd

(iv) $\left(x^{1/2}\, y^{1/3}\right)^6$ *is equal to*

(a) $x\,y$ *(b)* $x^2\, y^3$

(c) $x^3\, y^2$ *(d)* $(x\,y)^{3/36}$

(v) Scientific notation of 0.0000281 is

(a) 2.81×10^5 *(b)* 2.81×10^{-5}

(c) 28.1×10^{-6} *(d)* 28.1×10^6

(vi) Solution of equation $\log\,(x + 1) = 2$, is

(a) $x = 7$ *(b)* $x = 8$

(c) $x = 99$ *(d)* $x = 10$

(vii) To find $\log 32.97$, we use $\log - table$ to find

(a) characteristic *(b)* mantissa

(c) whole number *(d)* fraction

(viii) Antilog 3.4568 is equal to

(a) 0.2863 *(b)* 2.863

(c) 286.3 *(d)* 0.002863

(ix) $\log \frac{p}{qr}$ is equal to

(a) $\log p - \log q + \log r$ *(b)* $\log p - \log q - \log r$

(c) $\log p + \log q - \log r$ *(d)* $\log p + \log q + \log r$

(x) $3 \log 2 + \log 5 = ?$

(a) $\log 10$ *(b)* $\log 20$

(c) $\log p30$ *(d)* $\log 40$

(xi) $\log 3 + \log 4 + \log 5 - \log 6 = ?$

(a) 1 *(b)* 2

(c) 3 *(d)* 4

(xii) The integral part of log x is called

(a) characteristic *(b)* mantissa

(c) real part *(d)* rational part

(xiii) $\log(a^m \times b^n)$ is equal to

(a) $\log a + \log b$ (b) $m\log a + n\log b$

(c) $m(\log a + \log b)$ (d) $n(\log a + \log b)$

(xvi) $\log 200 - \log 2 = ?$

(a) 1 (b) 2

(c) 3 (d) 10

Model Class Test

Q.1- Tick ✓ the Correct Answer (1×7)

(i) Conjugate of $\sqrt{a} + \sqrt{b}$ is

(a) $\sqrt{a} - \sqrt{b}$ (b) $\frac{\sqrt{a}}{\sqrt{b}}$

(c) $\sqrt{a} + \sqrt{b}$ (d) $\sqrt{a}\quad\sqrt{b}$

(ii) $\frac{x^3 \times x^5}{x^4}$ is equal to

(a) x^{11} (b) $x\frac{15}{4}$

(c) x^4 (d) x^2

(iii) $\sqrt[3]{\sqrt{x}}$ is equal to

(a) $x^{1/3}$ (b) $x^{1/2}$

(c) $x^{1/6}$ (d) $x^{1/5}$

(iv) $\sqrt[4]{81x^{28}}$ is equal to

(a) $9x^{14}$ (b) $3x^7$

(c) $9x^7$ (d) $3x^{14}$

(v) If $\log 3 = 0.4771$ then $\log 9$ is equal to

(a) (0.4771) (b) $\frac{0.4771}{2}$

(c) $2(0.4771)$ (d) $(0.4771)^{1/2}$

(vi) $\log x + \log y - \log z$ is equal to

(a) $\log(xyz)$ (b) $\log\frac{xy}{z}$

(c) $\log\frac{x}{yz}$ (d) $\log\frac{z}{xy}$

(vii) If $\log_a x = y$ then

(a) $a^x = y$ (b) $a^x = y$

(c) $x^a = y$ (d) $a^y = x$

Q.2- Solve any five short questions. (2×5)

(i) State three laws of exponents.

(ii) Simplify $\sqrt[3]{125x^9y^{15}}$.

(iii) Simplify $\frac{2^3\times 9^{-1}}{27^{1/3}\times 8^{-1/3}}$.

(iv) Write in scientific notation 0.0000286.

(v) Subtract $\bar{4}.6342$ from 2.1375.

(vi) Prove that $\log_a(mn) = \log_a m + \log_a n$.

(vii) Simplify $\log 2 + 2\log 5 - \log 3 - 2\log 7$.

Q.3- Attempt any two questions.

(i) Using logarithm table evaluate $69.13\times 0.34\times 0.014$.

(ii) Simplify $\frac{(x^3y)^3(2xy)^{-2}}{4x^{-4}y^{-5}}$.

(iii) Prove the law of logarithm $\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$.

◆

UNIT 7 ARITHMATIC AND GEOMETRIC SEQUENCES

SHORT QUESTIONS

Q.1- What is general A.P and find its nth term.

Ans. General A.P is the progression $a, a+d, a+2d, a+3d \ldots$ where a is the 1st term and d is the common difference of A.P, So

$a_1 = a$, $a_2 = a+d$, $a_3 = a+2d$, $a_4 = a+3d \ldots$

These terms show that: $a_n = a+(n-1)d$

Q.2- Define and find arithmetic mean between a and b.

Ans. The number 'A' is said to be an arithmetic mean between two numbers a and b if a, A, b are in A.P, So,

$A-a = b-A =$ Common difference

$$\Rightarrow a+b = 2A \Rightarrow A = \frac{a+b}{2}$$

Q.3- 8 and 12 are two A,Ms between a and b. Find a and b.

Solution: By the given condition.

$a, 8, 12, b$ are in A P, So

$8-a = 12-8 = b-12 =$ Common difference

$8-a = 4 = b-12$

$8-a = 4$ and $4 = b-12$

$a = 4$ and $b = 16$

Q.4- Define a sequence or progression.

Ans. A sequence is an arrangement of numbers written in a definite order according to some specific rule. A sequence is also called progression. For example:

(i) $1, 3, 5, 7 \ldots$ (ii) $2, 6, 10, 14 \ldots$ (iii) $3, 6, 12, 24 \ldots$

These are sequences or progressions.

Q.-5 Differentiate finite and infinite sequence.

Ans. If a sequence has its last term, it is called finite sequence.

Example:

$1, 3, 5, 7, \ldots 31$ and $2, 6, 18, 54 \ldots, 486$ are finite sequences.

If a sequence does not have its last term, it is called infinite sequence.

Example: $2, 4, 6, 8, \ldots$

and $1, 5, 9, 13, \ldots$ are infinite sequences

Q.6- Define Arithmetic Progression (A.P)

Ans. The sequence of numbers in which each term is obtained by adding a fixed number to the preceding term is called arithmetic progression.

For Example: $3, 7, 11, 15, \ldots$ is an A.P

Q.7- Define Geometric Progression (G.P)

Ans. A sequence of numbers in which each term is obtained by multiplying the preceding term by a fixed number is called a geometric progression G.P.

Example: $2, 6, 18, 54, \ldots$ is a G.P.

Q.8- Define Geometric Mean between *a* and *b*. Find its value.

Ans. A number 'G' is said to be geometric mean between a and b if a, G, b are in G.P

i.e $\frac{G}{a} = \frac{b}{G} =$ Common ratio

$\Rightarrow G^2 = ab$

$\Rightarrow G = \pm\sqrt{ab}$

$\Rightarrow$ Positive G.M $= +\sqrt{ab}$

Q.9- How many terms are there in the A.P 3, 7, 11, ...59?

Solution: Here $a=3,\ d=4,\ a_n=59, n=?$

Using formula

$a_n = a+(n-1)d$

$59 = 3+(n-1)(4)$

$4(n-1) = 59-3$

$n-1=\frac{56}{4}$

$n = 14+1 = 15$

Thus there are 15 terms in this A.P

Q.10- Find G.M between $2x^2$ and $8y^4$.

Ans. Given that $a=2x^2, b=8y^4$

G.M = ?

We have.

$G=\sqrt{ab}$

$=\sqrt{2x^2\times 8y^4} = \sqrt{16x^2y^4}$

$G=4xy^2$

SOLVED EXERCISES

EXERCISE 7.1

Q.1- Write the first three of the following:

(i) $a_n = n+3$ **(ii)** $a_n=(-1)^n n^3$ **(iii)** $a_n = 3n+5$

(iv) $a_n=\frac{n+1}{2n+5}$ **(v)** $a_n=\frac{1}{(2n-1)^2}$ **(vi)** $a_2=n+3$

(vii) $a_n=\frac{1}{3^n}$ **(viii)** $a_n = 3n-5$ **(ix)** $a_n=(n+1)a_{n-1}, a_1=1$

Solution:-

(i) $a_n = n+3$

For n = 1, $a_1 = 1+3 = 4$

For n = 2, $a_2 = 2+3 = 5$

For n = 3, $a_3 = 3+3 = 6$

Thus the sequence is $a_1, a_2, a_3, \ldots = 4, 5, 6, \ldots$

(ii) $a_n = (-1)^n n^3$

For $n = 1$, $a_1 = (-1)^1 (1)^3 = -1$

For $n = 2$, $a_2 = (-1)^2 (2)^3 = 8$

For $n = 3$, $a_3 = (-1)^3 (3)^3 = -27$

Thus the sequence is $a_1, a_2, a_3, \ldots = -1, 8, -27, \ldots$

(iii) $a_n = 3n + 5$

For $n = 1$, $a_1 = 3(1)+5 = 8$

For $n = 2$, $a_2 = 3(2)+5 = 11$

For $n = 3$, $a_3 = 3(3)+5 = 14$

Thus the sequence is $a_1, a_2, a_3, \ldots = 8, 11, 14, \ldots$

(iv) $a_n = \dfrac{n+1}{2n+5}$

For $n = 1$, $a_1 = \dfrac{1+1}{2(1)+5} = \dfrac{2}{7}$

For $n = 2$, $a_2 = \dfrac{2+1}{2(2)+5} = \dfrac{3}{9} = \dfrac{1}{3}$

For $n = 3$, $a_3 = \dfrac{3+1}{2(3)+5} = \dfrac{4}{11}$

Thus the sequence is

$a_1, a_2, a_3, \ldots\ldots = \dfrac{2}{7}, \dfrac{1}{3}, \dfrac{4}{11}, \ldots\ldots$

(v) $a_n = \dfrac{1}{(2n-1)^2}$

For $n = 1$, $a_1 = \dfrac{1}{[2(1)-1]^2} = 1$

For $n = 2$, $a_2 = \dfrac{1}{[2(2)-1]^2} = \dfrac{1}{9}$

For $n = 3$, $a_3 = \frac{1}{[2(3)-1]^2} = \frac{1}{25}$

Thus the sequence is $a_1, a_2, a_3, \dots = 1, \frac{1}{9}, \frac{1}{25}, \dots$

(vi) $a_n = n+3$

For $n = 1$, $a_1 = 1+3 = 4$

For $n = 2$, $a_2 = 2+3 = 5$

For $n = 3$, $a_3 = 3+3 = 6$

Thus the sequence is $a_1, a_2, a_3, \dots = 4, 5, 6, \dots$

(vii) $a_n = \frac{1}{3^n}$

For $n = 1$, $a_1 = \frac{1}{3^1} = \frac{1}{3}$

For $n = 2$, $a_2 = \frac{1}{3^2} = \frac{1}{9}$

For $n = 3$, $a_3 = \frac{1}{3^3} = \frac{1}{27}$

Thus the sequence is $a_1, a_2, a_3, \dots = \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \dots$

(viii) $a_n = 3n-5$

For $n = 1$, $a_1 = 3(1)-5 = -2$

For $n = 2$, $a_2 = 3(2)-5 = 1$

For $n = 3$, $a_3 = 3(3)-5 = 4$

Thus the sequence is $a_1, a_2, a_3, \dots = -2, 1, 4, \dots$

(ix) $a_n = (n+1)a_{n-1}$ $\quad a_1 = 1$

For $n = 2$, $a_2 = (2+1)a_{2-1} = 3a_1$

$a_2 = 3(1) = 3 \quad \because \quad a_1 = 1$

For $n = 3$, $a_3 = (3+1)a_{3-1} = 4a_2$

$a_3 = 4(3) = 12$

Thus the sequence is $a_1, a_2, a_3, \dots = 1, 3, 12, \dots$

Q.2- Find the terms indicated in the following sequences

(i) $2,6,11,17....a_8$ **(ii)** $1,3,12,60....a_7$

(iii) $1,\frac{1}{3},\frac{1}{9},\frac{1}{27}....a_6$ **(iv)** $-1,1,3,5,....a_9$

(v) $\frac{1}{3},\frac{2}{5}.....a_5$ **(vi)** $1,-3,5,-7....a_9$

Solution:-

(i) $2,6,11,17,...a_8=?$

Here we see that 4 is added to 1st term . 5 is added to 2nd term and 6 is added to 3rd term and so on.

Thus we get

$2, 6, 11, 17, 24, 32, 41, 51,...$

Thus $a_8=51$ Ans.

(ii) $1,3,12,60,...a_7=?$

1st,2nd Third terms are multipled by 3, 4 5 respectively to find the next term. Thus in this way we get

$1, 3, 12, 60, 360, 2520, 20160,...$

Thus $a_7=20160$ Ans.

(iii) $1,\frac{1}{3},\frac{1}{9},\frac{1}{27},...a_6=?$

The given sequence is a G. P with Common ratio $\frac{1}{3}$

So we get

$1,\frac{1}{3},\frac{1}{9},\frac{1}{27},\frac{1}{21},\frac{1}{243},..........$

Thus $a_6=\frac{1}{243}$ Ans.

(iv) $-1, 1, 3, ...a_9=?$

It is an A. P with common difference of 2. So we get

$-1,1,3,4,5,7,9,11,13,15,...$

Thus $a_9=15$ Ans.

(v) $\frac{1}{3},\frac{2}{5},\ldots a_5=?$

The 1st two terms show that the sequence is

$\frac{1}{3},\frac{2}{5},\frac{3}{7},\frac{4}{9},\frac{5}{11}$

Thus $a_5=\frac{5}{11}$ Ans.

(vi) $1,-3,5,-7\ldots a_9=?$

Thus study of four terms shows that the Sequence is

$1, -3, 5, -7, 9, -11, 13, -15, 17, \ldots$

Thus $a_9=17$ Ans.

Q.3- Find the next four terms of the following sequences

(i) 12,16,20,27.... (ii) 1,3,7,15,31,....

(iii) −1,2,12,40,.... (iv) 9,11,14,17,19,22,..

(v) 4,8,12,16,...... (vi) −2,0,2,4,6,8,10,......

Solution:-

(i) $12, 16, 21, 27, \ldots$

4, 5, 6, are added to first, 2nd and 3rd terms, this way we get the sequence

$12, 16, 21, 27, 34, 42, 51, 61, \ldots$

(ii) $1, 3, 7, 15, 31, \ldots$

Study these terms and write the sequence. Multiply each term by *2* and add *1*, to get next term.

$1, 3, 7, 15, 31, 63, 127, 255, 511, \ldots$

(iii) $-1, 2, 12, 40, \ldots$

1st term is multiplied by *2* and then *4* is added to have 2nd term.

2nd term is multiplied by *2* and then *8* is added to obtain 3rd term.

3rd term is multiplied by *2* and then *16* is added.

Similarly next term can be found we get the sequence.

$-1, 2, 12, 40, 112, 288, 704, 1664, \ldots$

(iv) $9, 11, 14, 17, 19, 22, \ldots$

By considering the given terms, we find that the sequence is:

$9, 11, 14, 17, 19, 22, 25, 27, 30, 33, \ldots$

(v) $4, 8, 12, 16, \ldots$

This ia an A. P with common difference 4. So we get the sequence

$4, 8, 12, 16, 20, 24, 28; 32, \ldots$

(vi) $-2, 0, 2, 4, 6, 8, 10, \ldots$

This is also an A. P with common difference of 2. So the sequence is

$-2, 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, \ldots$

EXERCISE 7.2

Q.1- Find the specified term of the following A.P

(i) **3, 7, 11, ..; 61st term** **(ii)** $-4, -7, -10 \ldots a_{19}$

(iii) **6, 4, 2, ..; 45th term** **(iv)** $9, 14, 19 \ldots a_{14}$

(v) $11, 6, 1 \ldots a_{18}$

Solution:-

(i) $3, 7, 11, \ldots,$ 61st term $= a_{61} = ?$

Here, $a = 3, d = 7 - 3 = 4, n = 61$

We know that $a_n = a + (n-1)d$

Put the value of a, d and n

$$a_{61} = 3 + (61-1)(4) = 3 + 240 = 243 \text{ Ans.}$$

(ii) $-4, -7, -10, \ldots, a_{19} = ?$

Here, $a = -4, d = -3, n = 19$

We know that

$$a_n = a + (n-1)d$$

$$a_{19} = -4 + (19-1)(-3)$$

$$= -4 + (18)(-3) = -4 - 54 \quad a_{19} = -58 \text{ Ans.}$$

(iii) $6, 4, 2, \ldots,$ 45th term $= a_{45} = ?$

Here, $a = 6, d = -2, n = -45$

We know that $a_n = a + (n-1)d$

$a_{45} = 6 + (45-1)(-2)$

$a_{45} = 6 + (44)(-2) = 6 - 88 = -82$ Ans.

(iv) $9, 14, 19, \ldots = a_{14} = ?$

Here, $a = 9, d = 5, n = 14$

We know that $a_n = a + (n-1)d$

$a_{14} = 9 + (14-1)(5) = 9 + 65 = 74$ Ans.

(v) $11, 6, 1, \ldots = a_{18} = ?$

Here, $a = 11, d = -5, n = 18$

We know that $a_n = a + (n-1)d$

$a_{18} = 11 + (18-1)(-5)$

$= 11 + 17(-5) = 11 - 85 = -74$ Ans.

Q.2- Find the missing element using the formula of A.P $\mathbf{a_n = a + (n-1)d}$

(i) $a = 2, a_n = 402, n = 26$

(ii) $a_n = 81, d = -3, n = 18$

(iii) $a = 5, a_n = 61$ $n = 15$

(iv) $a = 16, a_n = 0$ $d = -\frac{1}{4}$

(v) $a = 10, a_n = 400$ $d = 5$

(vi) $a_n = 261$ $d = 4, n = 18$

Solution:-

(i) $a = 2, a_n = 402$ $n = 26$

Here, $d = ?$

Using formula $a_n = a + (n-1)d$

Put the values. $402 = 2 + (26-1)d$

$402 = 2 + (25)d$

$25d = 402 - 2 = 400$

$d = \frac{400}{25} = 16 \Rightarrow d = 16$ Ans.

(ii) $a_n = 81 \quad d = -3, \quad n = 18$

Here, $a = ?$, So

Use the formula $a_n = a + (n-1)d$

Put the values. $81 = a + (18 - 1)(-3)$

$$81 = a + (17) - 3$$

$$a = 81 + 51 = 132$$

$a = 132$ Ans.

(iii) $a = 5, \; a_n = 61 \quad n = 15$

Here, $d = ?$, So

Use the formula $a_n = a + (n-1)d$

Put the values. $61 = 5 + (15 - 1)d$

$$61 - 5 = 14d \Rightarrow 14d = 56$$

$d = \frac{56}{14} = 4$ Ans.

(iv) $a = 16, \; a_n = 0 \quad d = -\frac{1}{4} \quad n = ?$

Here, $n = ?$, So

Use the formula $a_n = a + (n-1)d$

Put the values. $0 = 16 + (n - 1)\left(-\frac{1}{4}\right)$

$$\frac{1}{4}(n - 1) = 16$$

$$n - 1 = 16 \times 4$$

$n = 64 + 1 = 65$ Ans.

(v) $a = 10, \; a_n = 400 \quad d = 5, \; n = ?$

Here, $n = ?$, So

Use the formula $a_n = a + (n-1)d$

Put the values. $400 = 10 + (n - 1)5$

$$5(n - 1) = 400 - 10$$

$n - 1 = \frac{390}{5}$. $n = 78 + 1 = 79$ Ans.

(vi) $a = 261,\ d = 4,\ n = 18,\ a = ?$

Here, n = ?, So

Use the formula $a_n = a + (n-1)d$

Put the values. $261 = a + (18 - 1)4$

$$= a + 17\,(4)$$

$$a + 68 = 261$$

$$a = 261 - 68 = 193 \text{ Ans.}$$

Q.3- Find the 15th term of an A. P where the 3rd term is 8 and the common difference is $\frac{1}{3}$

Solution:- $a_{15} = ?,\ a_3 = 8,\ d = \frac{1}{3}$

Consider, $a_3 = 8$

$\Rightarrow \quad a + 2d = 8$

$\Rightarrow \quad \because a_n = a + (n-1)d$

$\Rightarrow \quad a + 2\left(\frac{1}{3}\right) = 8$

$\Rightarrow \quad a = 8 - \frac{2}{3}$

$\Rightarrow \quad a = \frac{22}{3}$

Now $a_{15} = a + 14d \qquad \because a_n = a + (n-1)d$

$$= \frac{22}{3} + 14\left(\frac{1}{3}\right)$$

$$= \frac{36}{3} = 12 \qquad a_{15} = 12 \text{ Ans.}$$

Q.4- Which term of an A.P 6, 2, −2, ... is −146?

Solution:- $a = 6,\ d = -4,\ a_n = -146$ and n = ?

Put the values in the formula.

$$a_n = a + (n-1)d$$

$$-146 = 6 + (n-1)(-4)$$

$$-146-6=-4(n-1)$$
$$-152=-4(n-1)$$
$$(n-1)=\frac{152}{4}$$
$$n=38+1=39$$ Ans.

Q.5- Which term of an A.P 5, 2, −1, ... is −118?

Solution:-

$a=5,\ d=-3,\ a_n=-118\ n=?$

Put the values in the formula.

$$a_n=a+(n-1)d$$
$$-118=5+(n-1)(-3)$$
$$-118-5=-3(n-1)$$
$$3(n-1)=123$$
$$n-1=\frac{123}{3}$$
$$n=41+1=42$$ Ans.

Q.6- How many terms are there in an A.P in which $a_1=a=11$, $a_n=68$, $d=3$

Solution:-

$a=11,\ a_n=68,\ d=3, n=?$

Put the values in the formula.

$$a_n=a+(n-1)d$$
$$68=11+(n-1)(3)$$
$$3(n-1)=68-11$$
$$n-1=\frac{57}{3}$$
$$n=19+1=20$$ Ans.

Q.7- Find the 11th term of an A. P $2-x, 3-2x, 4-3x, \ldots$

Solution:-

$a_{11}=?,\ a=2-x,\ n=11,\ d=1-x$

$$a_{11}=a+10d$$

$=2-x+10(1-x)$

$a_{11}=12-11x$ Ans.

Q.8- Find the n^{th} term of an A. P where $a_{n-5}=3n+9$.

Solution:-

$a_{n-5}=3n+9$

To find a_n, replace n by $n+5$

In this equation

$a_{n+5-5}=3(n+5)+9$

$a_n=3n+15+9$

$a_n=3n+24$ Ans.

Q.9- Find the n^{th} term of an A. P $\left(\frac{3}{4}\right)^2, \left(\frac{3}{7}\right)^2, \left(\frac{3}{10}\right)^2, ...$

Solution:-

The given sequence is

$\left(\frac{3}{4}\right)^2, \left(\frac{3}{7}\right)^2, \left(\frac{3}{10}\right)^2, ...$

We see that only denominator is changing, so consider the sequence of denominators.

$4, 7, 10, ...$

Here $a=4$, $d=3$, $a_n=?$

$a_2=a+(n-1)d$

Put the values of a and d

$a_n=4+(n-1)(3) \quad =3n+1$

Thus the nth term of given sequence is

$$=\left(\frac{3}{3n+1}\right)^2 \text{ Ans.}$$

Q.10- If the n^{th} term of an A. P is $3n-5$. Find the A.P.

Solution:-

$a_n=3n-5$

Put $n = 1, 2, 3, 4, ...,$ We get

$a_1 = 3(1) - 5 = -2$

$a_2 = 3(2) - 5 = 1$

$a_3 = 3(3) - 5 = 4$

$a_4 = 3(4) - 5 = 7$

Thus the A. P. is

$-2, 1, 4, 7, \ldots$ Ans.

EXERCISE 7.3

Q.1- Find A.M between:

(i) $-3, 7$ ***(ii)*** $x-1, x+7$

(iii) $\sqrt{7}, 3\sqrt{7}$ ***(iv)*** $x^2+x+1; x^2-x+1$

Solution:-

(i) Here $a = -3, b = 7, A = ?$

$$A = \frac{a+b}{2} = \frac{-3+7}{2} \quad A = \frac{4}{2} = 2 \text{ Ans.}$$

(ii) Here $a = x-1, b = x+7, A = ?$

$$A = \frac{a+b}{2} = \frac{x-1+x+7}{2}$$

$$A = \frac{2x+6}{2} = \frac{2(x+3)}{2} = (x+3) \text{ Ans.}$$

(iii) $a = \sqrt{7}, b = 3\sqrt{7}, A = ?$

$$A = \frac{a+b}{2} = \frac{\sqrt{7}+3\sqrt{7}}{2} \quad A = \frac{4\sqrt{7}}{2} = 2\sqrt{7} \text{ Ans.}$$

(iv) $a = x^2+x+1, b = x^2-x+1, A = ?$

$$A = \frac{a+b}{2}$$

$$A = \frac{x^2+x+1+x^2-x+1}{2}$$

$$A = \frac{2x^2+2}{2} = \frac{2(x^2+1)}{2}$$

$A = x^2+1$ Ans.

Q.2- If 3 and 6 are two A.Ms between *a* and *b*, find *a* and *b*.

Solution:-

As 3 and 6 are two A. Ms between a and b.

So a, 3, 6, b are in A.P.

$\Rightarrow \quad 3-a=6-3=b-6=$ Common difference

$\Rightarrow \quad 3-a=3$ and $b-6=3$

$\Rightarrow \quad a=0$ and $b=9$ Ans.

Q.3- Find three A. Ms between 11 and 19.

Solution:-

Let A_1, A_2, A_3 be three A.Ms between 11 and 19.

So, $11,\ A_1,\ A_2,\ A_3\ ;\ 19$ are in A.P.

and $a_1=11\ ,\ a_5=19\ , d=?$

We have.

$$a_5=a+4d \qquad \because a_n=a+(n-1)d.$$

$\Rightarrow \quad 19=11+4d$

$\Rightarrow 4d=19-11=8$

$$d=\frac{8}{4}=2$$

Thus.

$A_1=11+d=11+2=13$

$A_2=A_1+d=13+2=15$

$A_3=A_2+d=15+2=17$

Thus 13, 15 and 17 are A.Ms between 11 and 19.

Q.4- Find three A. Ms between and $\sqrt{2}$ and $6\sqrt{2}$.

Solution:-

Let A_1, A_2, A_3 be A.Ms between $\sqrt{2}$ and $6\sqrt{2}$, Then $\sqrt{2}, A_1, A_2, A_3, 6\sqrt{2}$ are in A.P

Here $a=\sqrt{2}$ and $a_5=6\sqrt{2}$, $d=?$

Now $a_5=a+4d$

$$\Rightarrow 6\sqrt{2} = \sqrt{2} + 4d$$

$$4d = 6\sqrt{2} - \sqrt{2} = 5\sqrt{2}$$

$$d = \frac{5}{4}\sqrt{2}$$

Thus $A_1 = a + d = \frac{\sqrt{2}}{1} + \frac{5\sqrt{2}}{4}$

$$A_1 = \frac{4\sqrt{2} + 5\sqrt{2}}{4} = \frac{9\sqrt{2}}{4}$$

$$A_2 = A_1 + d = \frac{9\sqrt{2}}{4} + \frac{5\sqrt{2}}{4}$$

$$A_2 = \frac{9\sqrt{7} + 5\sqrt{2}}{4} = \frac{14\sqrt{2}}{4}$$

$$A_2 = \frac{7\sqrt{2}}{2}$$

$$A_3 = A_2 + d = \frac{7\sqrt{2}}{2} + \frac{5\sqrt{2}}{4}$$

$$A_3 = \frac{14\sqrt{2} + 5\sqrt{2}}{4} = \frac{19\sqrt{2}}{4}$$

Thus $\frac{9\sqrt{2}}{4}, \frac{7\sqrt{2}}{2}, \frac{19\sqrt{2}}{4}$ are the required AM.s

Q.5- Find 6 A. Ms between 5 and 8.

Solution:-

Let $A_1, A_2, A_3, A_4, A_5, A_6$ be the six A.Ms between 5 and 8, So

$5\ A_1, A_2, A_3, A_4, A_5, A_6, 8$ are in A.P

Here $a = 5$, $a_8 = 8$, $d = ?$

We have $a_8 = a + 7d$

$$\Rightarrow 8 = 5 + 7d$$

$$\Rightarrow 7d = 3 \Rightarrow d = \frac{3}{7}$$

Here $A_1 = a + d = 5 + \frac{3}{7}$

$A_1 = \frac{38}{7}$

$A_2 = A_1 + d = \frac{38}{7} + \frac{3}{7} = \frac{41}{7}$

$A_3 = A_2 + d = \frac{41}{7} + \frac{3}{7} = \frac{44}{7}$

$A_4 = A_3 + d = \frac{44}{7} + \frac{3}{7} = \frac{47}{7}$

$A_5 = A_4 + d = \frac{47}{7} + \frac{3}{7} = \frac{50}{7}$

$A_6 = A_5 + d = \frac{50}{7} + \frac{3}{7} = \frac{53}{7}$

Thus $\frac{38}{7}, \frac{41}{7}, \frac{44}{7}, \frac{47}{7}, \frac{50}{7}$, and $\frac{53}{7}$ are six AM.s between 5 and 8 .

Q.6- Find 7 A. Ms between 8 and 12.

Solution:-

Let $A_1, A_2, A_3, A_4, A_5, A_6, A_7$ are the seven A.Ms between 8 and 12

So

$8\ A_1, A_2, A_3, A_4, A_5, A_6, A_7\ 12$ are in A.P

Here $a = 8,\ a_9 = 12,\ d = ?$

We have $a_9 = a + 8d$

$\Rightarrow 12 = 8 + 8d \Rightarrow 8d = 4$

$\Rightarrow d = \frac{1}{2}$

Now $A_1 = a + d = 8 + \frac{1}{2} = \frac{17}{2}$

$$A_2 = A_1 + d = \frac{17}{2} + \frac{1}{2} = 9$$

$$A_3 = A_2 + d = 9 + \frac{1}{2} = \frac{19}{2}$$

$$A_4 = A_3 + d = \frac{19}{2} + \frac{1}{2} = 10$$

$$A_5 = A_4 + d = 10 + \frac{1}{2} = \frac{21}{2}$$

$$A_6 = A_5 + d = \frac{21}{2} + \frac{1}{2} = 11$$

$$A_7 = A_6 + d = 11 + \frac{1}{2} = \frac{23}{2}$$

Thus $\frac{17}{2}, 9, \frac{19}{2}, 10, \frac{21}{2}, 11, \frac{23}{2}$ are the seven AM.s between 8 and 12.

Q.7- If the A. Ms between 5 and b is 10, then find the value of b.

Solution:- As 10 is the A.M between 5 and b,

So, $5, 10, b$ are in A.P

$\Rightarrow 10 - 5 = b - 10 \Rightarrow b - 10 = 5$

$\Rightarrow b = 15$ Ans.

Q.8- If the A. Ms between a and 10 is 40, then find the value of a.

Solution:- As 40 is the A.M between a and 10,

So, $a, 40, 10$ are in A.P

$\Rightarrow 40 - a = 10 - 40$

$40 - a = -30 \Rightarrow a = 40 + 30 = 70 \quad \Rightarrow a = 70$ Ans.

Q.9- If the three A. Ms between a and b are 5, 9 and 13, find a and b.

Solution:- As $5, 9, 13,$ are three A.M between a and b,

So, $a, 5, 9, 13, b$ are in A.P

$\Rightarrow 5-a=9-5=13-9=b-13$

$\Rightarrow a=5-4=\pm 1 \Rightarrow a=1$ Ans.

Also $b-13=4 \Rightarrow b=17$ Ans.

EXERCISE 7.4

Q.1- Find the 7th term of a G.P 2, 8, 32, ...

Solution:- Given G.P is $2, 8, 32, \ldots$

Here $a=2, r=\frac{8}{2}=4, \quad n=7, \quad a_7=?$

We have the formula

$a_n=ar^{n-1}$

$\Rightarrow a_7=2(4)^{7-1}=2(4)^6=2(4096)$

$a_7=8192$ Ans.

Q.2- Find the 11^{th} term of a G.P 2, 6, 18, ...

Solution:- Given G.P is $2, 6, 18, \ldots$

Here $a=2, r=\frac{6}{2}=3, a_{11}=?, n=11$

So $a_n=ar^{n-1}$

$\Rightarrow a_{11}=2(3)^{11-1}=2(3)^{10}$

$a_{11}=2(59049)=118098$ Ans.

Q.3- Find the 6^{th} term of a G.P $-\frac{3}{2}, 3, -6 \ldots$

Solution:-

The given G.P is $-\frac{3}{2}, 3, -6, \ldots$

Here $a=-\frac{3}{2}, r=\frac{3}{\left(-\frac{3}{2}\right)}=-2, a_6=?, n=6$

We have. $a_n=ar^{n-1}$

$a_6=\frac{3}{2}(-2)^{6-1}=-\frac{3}{2}(-2)^5$

$= -\frac{3}{2}(-32) = -3(-16)$

$a_n = 48$ Ans.

Q.4- Find the 5th term of a G.P $4, -12, 36\ldots$

Solution:- Given G.P is $4, -12, 36, \ldots$

Here $a = 4, r = \frac{-12}{4} = -3,\ a_5 = ?\ , n = 5$

We have $a_n = ar^{n-1}$

$\Rightarrow a_5 = 4(-3)^{5-1} = 4(-3)^4$

$a_5 = 4(81) \Rightarrow a_5 = 324$ Ans.

Q.5- Find the missing elements of the G.P:

(i) $\mathbf{r = 10, a_n = 100, a = 1}$

(ii) $\mathbf{a_n = 400, r = 2, a = 25}$

(iii) $\mathbf{a = 128,\ r = \frac{1}{2},\ a_n = \frac{1}{4}}$

Solution:-

(i) $a_n = 100, r = 10, a = 1, n = ?$

$a_n = ar^{n-1}$

$\Rightarrow 100 = 1(10)^{n-1} \Rightarrow (10)^{n-1} = (10)^2$

$\Rightarrow n - 1 = 2 \Rightarrow n = 3$ Ans.

(ii) $a_n = 400, r = 2, a = 25, n = ?$

$a_n = ar^{n-1}$

$\Rightarrow 400 = 25(2)^{n-1} \Rightarrow 2^{n-1} = \frac{400}{25} = 16$

$2^{n-1} = 2^4$

$\Rightarrow n - 1 = 4 \Rightarrow n = 5$ Ans.

(iii) $a = 128, r = \frac{1}{2}, a_n = \frac{1}{4},\ n = ?$

Here we have $a_n = ar^{n-1}$

$\frac{1}{4} = 128\left(\frac{1}{2}\right)^{n-1}$

$$\Rightarrow\left(\frac{1}{2}\right)^{n-1}=\frac{1}{4\times 128}=\frac{1}{2^2\times 2^7}$$

$$\Rightarrow\left(\frac{1}{2}\right)^{n-1}=\left(\frac{1}{2}\right)^9 \Rightarrow n-1=9 \quad \Rightarrow n=10$$ Ans.

Q.6- Find the 11th term of a G.P whose 5th term is 9 and common ratio is 2.

Solution:- Here $a_n=?,\ a_5=9,r=2.$

We have $a_n=ar^{n-1}$

$a_5=ar^4$

$9=a(2)^4 \Rightarrow 16a=9$

$$\Rightarrow a=\frac{9}{16}$$

Now $a_{11}=ar^{10}=\frac{9}{16}(2)^{10}$

$$a_{11}=\frac{9}{(2)^4}\times(2)^{10}=\frac{9}{\cancel{(2)^4}}\times\cancel{(2)^4}\times(2)^6$$

$a_{11}=9\times 64=576$ Ans.

Q.7- Find the 13th term of a G.P whose 7th term is 25 and common ratio is 3.

Solution:- $a_{13}=?,\ a_7=25,r=3$

We have $a_n=ar^{n-1}$

$\Rightarrow a_7=ar^6 \Rightarrow 25=a(3)^6$

$$\Rightarrow 25=729a \Rightarrow a=\frac{25}{729}$$

Now $a_{13}=ar^{12} \Rightarrow a_{13}=\left(\frac{25}{729}\right)(3)^{12}$

$$a_{13}=\frac{25}{(3)^6}\times(3)^6\times(3)^6$$

$a_{13}=25\times(3)^6=25\times 729$

$a_{13}=18225$ Ans.

Q.8- If a, b, c, d, are in G.P , show that, $a-b, b-c, c-d$ are in G.P.

Solution:- As a, b, c, d are in G.P

So $\frac{b}{a}=\frac{c}{b}=\frac{d}{c}=$ Common Ratio

$\Rightarrow \frac{b}{a}=\frac{c}{b}$, $\frac{c}{b}=\frac{d}{c}$. and $\frac{d}{c}=\frac{b}{a}$

$\Rightarrow b^2=ac$, $c^2=bd$ $ad=bc$ .... (A)

Now we have to Prove that

$a-b, b-c, c-d$ are in G.P

Consider

$(b-c)^2=b^2+c^2-2bc$

$=b^2+c^2-bc-bc$

Using results (A)

$(b-c)^2=ac+bd-ad-bc$

$=ac-ad-bc+bd$

$=a(c-d)-b(c-d)$

$(b-c)(b-c)=(a-d)(c-d)$

$\frac{(b-c)}{(a-b)}=\frac{(c-d)}{(b-c)}$

It means.

$a-b, b-c, c-d$ are in G.P.

Q.9- Find the nth term of a G.P, if $\frac{a_5}{a_3}=\frac{4}{9}$ and $a_2=\frac{4}{9}$

Solution:-

$a_n=?$, $\frac{a_5}{a_3}=\frac{4}{9}$, $a_2=\frac{4}{9}$

Consider

$\frac{a_5}{a_3}=\frac{4}{9}$ $\Rightarrow \frac{ar^4}{ar^2}=\frac{4}{9}$

$$\Rightarrow r^2 = \frac{4}{9} \Rightarrow r = \pm\frac{2}{3}$$

$$a_2 = \frac{4}{9} \Rightarrow ar = \frac{4}{9}$$

If $r = +\frac{2}{3} \Rightarrow a\left(\frac{2}{3}\right) = \frac{4}{9} \Rightarrow a = \frac{2}{3}$

If $r = -\frac{2}{3} \Rightarrow a\left(-\frac{2}{3}\right) = \frac{4}{9} \Rightarrow a = -\frac{2}{3}$

Now $a_n = ar^{n-1}$

If $r = \frac{2}{3}$, $a = \frac{2}{3}$, Then

$$a_n = \frac{2}{3}\left(\frac{2}{3}\right)^{n-1} = \left(\frac{2}{3}\right)^n \text{ Ans.}$$

If $r = -\frac{2}{3}$, $a = -\frac{2}{3}$, Then

$$a_n = -\frac{2}{3}\left(-\frac{2}{3}\right)^{n-1} = \left(-\frac{2}{3}\right)^n$$

Thus $a_n = \left(\frac{2}{3}\right)^n$ Or $a_n = \left(-\frac{2}{3}\right)^n$ Ans.

Q.10- Find three consecutive numbers in G.P, whose sum is 26 and their product is 216.

Solution:- Let the three required numbers be

$\frac{a}{r}, a, ar$ in G.P.

By the 1st condition

$$\frac{a}{r} + a + ar = 26 \quad \text{.............} (1)$$

Now using 2nd condition

$$\left(\frac{a}{r}\right)(a)(ar) = 216$$

$a^3 = 6^3 \Rightarrow a = 6$

Put it in (1) $\frac{6}{r} + 6 + 6r = 26$

$\frac{6}{r} + 6r = 20$

$\frac{3}{r} + 3r = 10$

$\Rightarrow 3 + 3r^2 = 10r$

$\Rightarrow 3r^2 - 10r + 3 = 0$

$\Rightarrow 3r^2 - 9r - r + 3 = 0$

$\Rightarrow 3r(r-3) - 1(r-3) = 0$

$\Rightarrow (3r-1)(r-3) = 0$

$\Rightarrow 3r - 1 = 0$ or $r - 3 = 0$

$r = \frac{1}{3}$ or $r = 3$

Now if $r = \frac{1}{3}$ and $a = 6$

The required numbers in A.P are

$\frac{a}{r}, a, ar = \frac{1}{\frac{1}{3}}, 6, 6\left(\frac{1}{3}\right) = 18, 6, 2$

If $a = 6$ and $r = 3$. Then

$\frac{a}{r}, a, ar = \frac{6}{3}, 6, 6(3) = 2, 6, 18$

Thus the numbers are.

$18, 6, 2$ or $2, 6, 18$ Ans.

Q.11- Find the 30th term of a G.P $x, 1, \frac{1}{x}, \ldots$

Solution:-

$a_{30} = ?,\ a = x,\ r = \frac{1}{x},\ n = 30$

$a_{30} = ar^{29}$

$a_{30} = x\left(\frac{1}{x}\right)^{29} = \left(\frac{1}{x}\right)^{28}$

$a_{30} = \frac{1}{x^{28}}$ Ans.

Q.12- Find the p^th^ term of a G.P $x, x^3, x^5, \ldots$

Solution:-

$a_p = ?,\ a = x,\ r = x^2,\ n = p$

We have $a_n = ar^{n-1}$

$\Rightarrow a_p = x(x^2)^{p-1}$

$\Rightarrow a_p = x\,x^{2p-2} \Rightarrow a_p = x^{2p-2+1}$

$a_p = x^{2p-1}$ Ans.

SOLVED EXERCISES

EXERCISE 7.5

Q.1- Find G.M between: *(i)* 9 and 5 *(ii)* 4 and 9 *(iii)* −2 and −8.

Solution:-

(i) $a = 9, b = 5$

G.M $= \pm\sqrt{ab}$

$= \pm\sqrt{9\times 5}$

G $= \pm 3\sqrt{5}$ Ans.

(ii) $a = 4\ b = 9,$

G.M $= \pm\sqrt{ab} = \pm\sqrt{4\times 9} = \pm 2\times 3$

G $= \pm 6$ Ans.

(iii) $a = -2,$ and $b = -8$

G.M $= \pm\sqrt{ab} = \pm\sqrt{(-2)\times(-8)}$

$= \pm\sqrt{16} = \pm 4$

G $= \pm 4$ Ans.

Q.2- Insert two G.Ms between: *(i)* 1 and 8 *(ii)* 3 and 81

Solution:-

(i) Let G_1, and G_2 be the two G.Ms between 1 and 8.

So, $1, G_1, G_2, 8$ are in G.P

Here $a = 1,\ a_4 = 8,\ r = ?$

We have $a_n = ar^{n-1}$

$\Rightarrow a_4 = ar^3$

$\Rightarrow 8 = 1(r^3)$ Putting values of a_4 and a

$\Rightarrow r^3 = 2^3 \Rightarrow r = 2$

Now $G_1 = ar = 1(2) = 2$

$G_2 = G_1 r = 2(2) = 4$

Thus 2 and 4 are two G.Ms between 1 and 8

(ii) Let G_1, and G_2 two G.Ms between 3 and 81. So,

$3, G_1, G_2, 81$ are in G.P

Here $a = 3,\ a_4 = 81,\ r = ?$

We have $a_n = ar^{n-1}$

$\Rightarrow a_4 = ar^3$

$\Rightarrow 81 = 3(r^3) \Rightarrow r^3 = 27$

$\Rightarrow r^3 = 3^3 \Rightarrow r = 3$

Now $G_1 = ar = 3(3) = 9$

$G_2 = G_1 r = 9(3) = 27$

Thus 9 and 27 are two G.Ms between 3 and 81

Q.3- Insert three G.Ms between: *(i)* 1 and 16 *(ii)* 2 and 32

Solution:-

(i) Let G_1, G_2, G_3 be three G.Ms between 1 and 16.

So, $1, G_1, G_2, G_3, 16$ are in G.P

Here $a = 1,\ a_5 = 16,\ r = ?$

We have $a_n = ar^{n-1}$

$\Rightarrow a_5 = ar^4$

$16 = 1(r^4) \Rightarrow (r^4) = 16$

$\Rightarrow r^4 = 2^4 \Rightarrow r = 2$

Now $G_1 = ar = 1(2) = 2$

$G_2 = G_1 r = 2(2) = 4$

$G_3 = G_2 r = 4(2) = 8$

Thus 2, 4, 8 are three G.Ms between 1 and 16. Ans.

(ii) Let G_1, G_2, G_3 be three G.Ms between 2 and 32.

So; $2, G_1, G_2, G_3\ 32$ are in G.P

Here $a = 2, a_5 = 32, r = ?$

We have $a_n = ar^{n-1}$

$\Rightarrow a_5 = ar^4$

$32 = 2(r^4) \Rightarrow (r^4) = 16$

$\Rightarrow r^4 = 2^4 \Rightarrow r = 2$

Now $G_1 = ar = 2(2) = 4$

$G_2 = G_1 r = 4(2) = 8$

$G_3 = G_2 r = 8(2) = 16$

Thus 4, 8, 16 are three G.Ms between 2 and 32.

Q.4- Insert four real geometric means between:3 and 96

Solution:-

Let G_1, G_2, G_3, G_4 be four G.Ms between 3 and 96

So, $3, G_1, G_2, G_3, G_4\ 96$ are in G.P

Here $a = 3, a_6 = 96, r = ?$

Now $a_n = ar^{n-1}$

$\Rightarrow a_6 = ar^5 \Rightarrow 96 = 3r^5$

$\Rightarrow r^5 = 32 \Rightarrow r^5 = 2^5$

$\Rightarrow r = 2$

Now $G_1 = ar = 3(2) = 6$

$G_2 = G_1 r = 6(2) = 12$

$G_3 = G_2 r = 12(2) = 24$

$G_4 = G_3 r = 24(2) = 48$

Thus 6, 12, 24, 48 are four G.Ms between 3 and 96.

Q.5- The A.Ms between two numbers is 5 and their positive G.M is 4. Find the numbers.

Solution:-

Let a and be the required numbers. According to the given conditions

A.M $= 5$ and G.M $= 4$

$\Rightarrow \frac{a+b}{2} = 5$ and $\sqrt{ab} = 4$

$a+b=10$ ....(1) and $ab=16$..........(2)

From (1) $b=10-a$, Put in (2)

$a(10-a)=16$

$\Rightarrow 10a-a^2=16$

$\Rightarrow a^2-10a+16=0$

$\Rightarrow a^2-8a-2a+16=0$

$\Rightarrow a(a-8)-2(a-8)=0$

$\Rightarrow (a-2)(a-8)=0$

$\Rightarrow a-2=0$ or $a-8=0$

$a=2$ or $a=8$

Put these in (1), We get.

$b=8$ Or $b=2$ Ans.

Thus the required numbers are 2 and 8

Q.6- The positive G.M between two numbers is 6 and the A.M between them is 10. Find the numbers.

Solution:-

Let a and b be the two required numbers.

So, according to the given conditions

A.M $= 10$ and G.M $= 6$

$\Rightarrow \frac{a+b}{2} = 10$ and $\sqrt{ab} = 6$

$a+b=20$ ....(1) and $ab=36$ ....(2)

From (1) $b=20-a$, Put in (2) We get

$a(20-a)=36$

$20a-a^2=36$

$a^2-18a-2a+36=0$

$(a-2)(a-18)=0$

$\Rightarrow a-2=0$ or $a-18=0$

$a=2$ or $a=18$

Put these in (1) , We get.

$b=18$ or $b=2$

Thus the required numbers are 2 and 18

Q.7- Show that the A.M between two numbers 4 and 8 is greater than their geometric mean.

Solution:-

$a=4$, $b=8$

$$\text{A.M}=\frac{a+b}{2}=\frac{4+8}{2}=6$$

$$\text{G.M}=\sqrt{ab}=\sqrt{4\times 8}=\sqrt{32}=5.66$$

Thus $\text{A.M}>\text{G.M} \because 6>5.66$

Q.8- Insert four geometric means between 160 and 5.

Solution:-

Let G_1, G_2, G_3, G_4 be four G.Ms between 160 and 5

So, $160, G_1, G_2, G_3, G_4\ 5$ are in G.P

Here $a=160, a_6=5, r=?$

We have $a_6=ar^5$

$$\Rightarrow 5=160r^5 \Rightarrow r^5=\frac{5}{160}$$

$$\Rightarrow r^5=\frac{1}{32} \Rightarrow r^5=\left(\frac{1}{2}\right)^5$$

$$r=\frac{1}{2}$$

Thus $G_1 = ar = 160 \times \frac{1}{2} = 80$

$G_2 = G_1 r = 80 \times \frac{1}{2} = 40$

$G_3 = G_2 r = 40 \times \frac{1}{2} = 20$

$G_4 = G_3 r = 20 \times \frac{1}{2} = 10$

Thus $80, 40, 20, 10$ are four G.Ms between 160 and 5

Q.9- Insert three geometric means between 486 and 6.

Solution:-

Let G_1, G_2, G_3 be three G.Ms between 486 and 6

So, $486, G_1, G_2, G_3, 6$ are in G.P

Here $a = 486, a_5 = 6, r = ?$

We have $a_5 = a r^4$

$$\Rightarrow 6 = 486 r^4 \Rightarrow r^4 = \frac{4}{486} = \frac{1}{81}$$

$$\Rightarrow r^4 = \left(\frac{1}{3}\right)^4 \Rightarrow r = \frac{1}{3}$$

Thus $G_1 = ar = 486 \times \frac{1}{3} = 162$

$G_2 = G_1 r = 162 \times \frac{1}{3} = 54$

$G_3 = G_2 r = 54 \times \frac{1}{3} = 18$

Thus $162, 54, 18$ are three G.Ms between 486 and 6.

Q.10- Insert four geometric means between $\frac{1}{8}$ and 120.

Solution:- Let G_1, G_2, G_3, G_4 be four

G.Ms between $\frac{1}{8}$ and 120

So, $\frac{1}{8}, G_1, G_2, G_3, G_4\ 120$ are in G.P

Here $a=\frac{1}{8},\ a_6=128,\ r=?$

We have $a_6=ar^5$

$$\Rightarrow 128=\frac{1}{8}r^5 \Rightarrow r^5=1024$$

$$\Rightarrow r^5=(4)^5 \Rightarrow r=4$$

Thus $G_1=ar=\frac{1}{8}\times 4=\frac{1}{2}$

$$G_2=G_1r=\frac{1}{2}\times 4=2$$

$$G_3=G_2r=2\times 4=8$$

$$G_4=G_3r=8\times 4=32$$

Thus $\frac{1}{2}, 2, 8, 32$ are four G.Ms between $\frac{1}{8}$ and 128

Q.11- Insert six geometric means between 56 and $-\frac{7}{16}$.

Solution:-

Let $G_1, G_2, G_3, G_4, G_5, G_6$

be six G.Ms between 56 and $-\frac{7}{16}$

So, $56, G_1, G_2, G_3, G_4, G_5, G_6, -\frac{7}{16}$ are in G.P

Here $a=56,\ a_8=-\frac{7}{16},\ r=?$

We have $a_8=ar^7 \Rightarrow -\frac{7}{16}=56r^7$

$$\Rightarrow r^7=-\frac{7}{16}\times\frac{1}{56}$$

$$\Rightarrow r^7 = -\frac{1}{128} \Rightarrow r^7 = \left(-\frac{1}{2}\right)^7$$

$$\Rightarrow r = -\frac{1}{2}$$

Thus $G_1 = ar = 56 \times -\frac{1}{2} = -28$

$$G_2 = G_1 r = -28 \times -\frac{1}{2} = 14$$

$$G_3 = G_2 r = 14 \times -\frac{1}{2} = -7$$

$$G_4 = G_3 r = -7 \times -\frac{1}{2} = \frac{7}{2}$$

$$G_5 = G_4 r = \frac{7}{2} \times -\frac{1}{2} = -\frac{7}{4}$$

$$G_6 = G_5 r = -\frac{7}{4} \times -\frac{1}{2} = \frac{7}{8}$$

Thus $-28, 14, -7, \frac{7}{2}, -\frac{7}{4}, \frac{7}{8}$ are four G.Ms between 56 and $-\frac{7}{16}$

Q.12- Insert five geometric means between $\frac{32}{81}$ and $\frac{9}{2}$

Solution:-

Let G_1, G_2, G_3, G_4, G_5

be five G.Ms between $\frac{32}{81}$ and $\frac{9}{2}$

So, $\frac{32}{81}, G_1, G_2, G_3, G_4, G_5, \frac{9}{2}$ are in G.P

Here $a = \frac{32}{81}, a_7 = \frac{9}{2}, r = ?$

We have $a_7 = ar^6 \Rightarrow \frac{9}{2} = \frac{32}{81}r^6$

$$\Rightarrow r^6 = \frac{9 \times 81}{32 \times 2} = \frac{729}{64}$$

$$\Rightarrow r^6 = \left(\frac{3}{2}\right)^6 \Rightarrow r = \frac{3}{2}$$

Now $G_1 = ar = \frac{32}{81} \times \frac{3}{2} = \frac{16}{27}$

$$G_2 = G_1 r = \frac{16}{27} \times \frac{3}{2} = \frac{8}{9}$$

$$G_3 = G_2 r = \frac{8}{9} \times \frac{3}{2} = \frac{4}{3}$$

$$G_4 = G_3 r = \frac{4}{3} \times \frac{3}{2} = 2$$

$$G_5 = G_4 r = 2 \times \frac{3}{2} = 3$$

Thus $\frac{16}{27}, \frac{8}{9}, \frac{4}{3}, 2, 3$ are three G.Ms between $\frac{32}{81}$ and $\frac{9}{2}$.

Review Exercise 7

Q.1- Encircle the correct answer.

(i) Third term of $a_n = n + 3$, when $n = 0$ is

(a) 3 (b) 6 (c) 9 (d) 0

(ii) Fourth term of $a_n = \frac{1}{(2n-1)^2}$, is

(a) $\frac{1}{7}$ (b) $\frac{1}{49}$ (c) $\frac{1}{81}$ (d) 0

(iii) For $2, 6, 11, 17, \ldots, a_5$ is

(a) 24 (b) 30 (c) 21 (d) 22

(iv) Next term of $12, 16, 21, 27$ is

(a) 34 (b) 30 (c) 31 (d) 32

(v) a_6 of $3, 7, 11, \ldots$ is

(a) 3 (b) 19 (c) 23 (d) 20

(vi) A.M between $\sqrt{3}$ and $3\sqrt{3}$ is

(a) $2\sqrt{3}$ (b) $5\sqrt{3}$ (c) $9\sqrt{3}$ (d) $4\sqrt{3}$

(vii) A.M between $2\sqrt{5}$ and $6\sqrt{5}$ is

(a) $4\sqrt{5}$ (b) $3\sqrt{5}$ (c) $5\sqrt{5}$ (d) $7\sqrt{5}$

(viii) a_5 of $2, 6, 18, \ldots$ is

(a) 160 (b) 161 (c) 162 (d) 30

(ix) G.M between -3 and -12 is

(a) ± 6 (b) 6 (c) -6 (d) ± 3

(x) G.M between 1 and 8 is

(a) $2\sqrt{2}$ (b) $\pm 2\sqrt{2}$ (c) $-2\sqrt{2}$ (d) $\sqrt{2}$

Ans:

(i) b	(ii) b	(iii) a	(iv) a
(v) b	(vi) a	(vii) a	(viii) c
(ix) c	(x) a		

Q.2- Fill in the blanks.

(i) The general or nth term of a sequence is denoted by__

(ii) If $a_n = 2n+3$, then $a =$ _____

(iii) In an A.P $a_n = a+(n-1)d$, is called _____

(iv) A.M between 5 and 15 is_____

(v) If a, A, b is an A.P then A =_____

(vi) In a G.P, "r" is called_____

(vii) In a G.P, $a_n =$ _____

(viii) If a, G, b is a G.P, then G =_____

(xi) Positive geometric mean between 2 and 3 is_____

(x) The n^{th} term of an A.P when $a_{n-5} = 3n+9$

Ans:

(i) a_n	(ii) 5	(iii) General term	(iv) 10
(v) $\frac{a+b}{2}$	(vi) Common ratio	(vii) ar^{n-1}	(viii) $\pm\sqrt{ab}$
(ix) $\sqrt{6}$	(x) $a_n = 3n + 24$		

Q.3- Find the general term and the 18th term of an A.P, whose first term is 3 and the common difference is 2.

Solution:- We are given that

$a = 3,\ d = 2, a_n = ?, a_{18} = ?$

Using the formula $a_n = a + (n-1)d$

Putting the values of a and d, We get

$a_n = 3 + (n-1)(2)$

$a_n = 3 + 2n - 2$

$a_n = 2n + 1$ Ans.

To find a_{18}, Put $n = 18$

$a_{18} = 2(18) + 1 = 37$ Ans.

Q.4- Find the n^{th} term of an A.P $\left(\frac{3}{5}\right)^3, \left(\frac{3}{7}\right)^3, +\left(\frac{3}{9}\right)^3, \ldots$

Solution:- Consider the sequence of denominates $5, 7, 9, \ldots$

This is an A.P and.

Here $a = 5,\ d = 2, a_n = ?$

Using the formula $a_n = a + (n-1)d$

Putting the values of a and d, We get

$a_n = 5 + (n-1)(2)$

$a_n = 5 + 2n - 2$

$a_n = 2n + 3$

Thus the n^{th} term of given sequence is

$$a_n = \left(\frac{3}{2n+3}\right)^3$$

Q.5- If the A.M between a and 16 is 24. Then find the value of 'a'.

Solution:- We are given that

A.M between a and $16 = 24$

$$\Rightarrow \frac{a+16}{2} = 24$$

$$a + 16 = 48$$

$$a = 48 - 16 = 32$$

$a = 32$ Ans.

Q.6- Find the 15th term of a G.P. whose 7th term is 27 and common ratio is 3.

Solution:- For a G.P $a_{15} = ?$

$$a_7 = 27, \ r = 3$$

$$\Rightarrow ar^6 = 27$$

$$a(3)^6 = 27$$

$$\Rightarrow a = \frac{27}{(3)^6} = \frac{27}{729} = \frac{1}{27}$$

Now $a_{15} = ar^{14}$

$$= \frac{1}{27}(3)^{14} = \frac{(3)^{14}}{(3)^3}$$

$$= (3)^{14-3} = 3^{11}$$

$a_{15} = 3^{11}$ Ans.

Q.7- Insert four Geometric Means between $\frac{1}{2}$ and 16.

Solution:-

Let G_1, G_2, G_3, G_4 be four G.Ms between $\frac{1}{2}$ and 16.

So, $\frac{1}{2}, G_1, G_2, G_3, G_4, 16$ are in G.P

Here, $a = \frac{1}{2}, a_6 = 16, r = ?$

We know that $a_6 = ar^5$

$16 = \frac{1}{2} r^5$

$r^5 = 32$

$r^5 = (2)^5 \Rightarrow r = 2$

Thus $G_1 = ar = \frac{1}{2} \times 2 = 1$

$G_2 = G_1 r = 1(2) = 2$

$G_3 = G_2 r = (2)(2) = 4$

$G_4 = G_3 r = (4)(2) = 8$

Thus $1, 2, 4, 8$ are four G.Ms between $\frac{1}{2}$ and 16.

Q.8- Find the three consecutive numbers in G.P, whose sum is 26 and their product is 216.

Solution:-

Let $\frac{a}{r}, a, ar$ be the required numbers in G.P. So

According to the given conditions.

$\frac{a}{r} + a + ar = 26$ ....(1)

And $\left(\frac{a}{r}\right)(a)(ar) = 216$

$a^3 = (6)^3$

$a = 6$

Put it in (1)

$\frac{6}{r} + 6 + 6r = 26$

$\frac{6}{r} + 6r = 20$

$\frac{3}{r} + 3r = 10$

$\Rightarrow 3+3r^2=10r$

$\Rightarrow 3r^2-10r+3=0$

$\Rightarrow 3r(r-3)-1(r-3)=0$

$\Rightarrow (3r-1)(r-3)=0$

$\Rightarrow 3r-1=0$ or $r-3=0$

$r=\frac{1}{3}$ or $r=3$

Thus if $a=6$ and $r=\frac{1}{3}$

the required numbers are

$\frac{a}{r},a,ar$

$=\frac{6}{\frac{1}{3}},6,6\left(\frac{1}{3}\right)$

$=18,6,2$

If $r=3$, $a=6$, Then

$\frac{a}{r},a,ar=\frac{6}{3},6,6,(3)=2,6,18$

Thus 2, 6, 18 are the required three numbers.

MULTIPLE CHOICE QUESTIONS

Q.1- Tick the Correct answer:

(i) If 2, 5, 9, 14, ... is a sequence then 7th term is

(a) 28 (b) 35

(c) 44 (d) 40

(ii) Given that $a_{n-2}=3n+2$, then $a_3=?$

(a) 11 (b) 13

(c) 15 (d) 17

(iii) 2, 6, 11, 17, ... $a_8=?$

(a) 41 (b) 51 (c) 31 (d) 32

(iv) In an A.P general term is

(a) $a+(n+1)d$ (b) $a+(n-1)d$

(c) $a-(n+1)d$ (d) $a-(n-1)d$

(v) In an A.P $a=-1$, $d=1$ then $a_n=?$

(a) n (b) $n-1$

(c) $n-2$ (d) $n+1$

(vi) $7th$ term of the sequence $\left(\frac{3}{7}\right)^2, \left(\frac{3}{10}\right)^2, \left(\frac{3}{13}\right)^2, \ldots$ is

(a) $\left(\frac{3}{19}\right)^2$ (b) $\left(\frac{3}{22}\right)^2$

(c) $\left(\frac{3}{25}\right)^2$ (d) $\left(\frac{3}{20}\right)^2$

(vii) Which term of the sequence $6, 2, -2, \ldots$ is -30.

(a) 8th (b) 9th (c) 10th (d) 11th

(viii) If 8 and 12 are two A.Ms between a and b
The values of a and b are.

(a) $4, 10$ (b) $4, 16$ (c) $6, 10$ (d) $10, 14$

(ix) $6th$ term of G.P $2, 6, 18, \ldots$ is

(a) 162 (b) 486 (c) 1458 (d) 54

(x) A.M between x^2+x+1 and x^2-x+1 is

(a) x^2+1 (b) x^2-1 (c) $1-x^2$ (d) $2x^2+1$

(xi) The $30th$ term of G.P $x, 1, \frac{1}{x}, \ldots$ is

(a) x^{29} (b) x^{28} (c) $\frac{1}{x^{28}}$ (d) $\frac{1}{x^{30}}$

(xii) G.M between $2x^2$ and $8y^4$ is

(a) $\pm 5xy^2$ (b) $\pm 4xy^2$ (c) $\pm 4x^2y$ (d) $\pm 4x^2y^4$

(xiii) Two G.Ms between 4 and $\frac{1}{2}$ are.

(a) $2, 1$ (b) $2, 0$ (c) $3, 1$ (d) $1, \frac{1}{4}$

(xiv) G.Ms between -2 and -8 is.

(a) -5 *(b)* -4 *(c)* $+4$ *(d)* ± 4

(xv) A.M between a and 16 is 24. Then $a = ?$

(a) 8 *(b)* 32 *(c)* 10 *(d)* 30

(xvi) The basic Property of A.P is

(a) Common Ratio *(b)* Common Factor

(c) Common Difference *(d)* Common Divisor

(xvii) The basic Property of G.P is

(a) Common Ratio *(b)* Common Factor

(c) Common Difference *(d)* Common Divisor

MODEL CLASS TEST

Time : One Hour Max Marks : 25

Q.1- Tick the Correct answer. (7)

(i) A sequence having its last term is called

(a) Finite sequence *(b)* Infinite sequence

(c) Arithmetic sequence *(d)* G.P

(ii) $a_{n-2} = 5n-6$ Then a_4 is equal to

(a) 14 *(b)* 24 *(c)* 34 *(d)* 4

(iii) The sequence $\frac{1}{16}, \frac{1}{8}, \frac{1}{4}, \ldots$

(a) Finite sequence *(b)* an A.P *(c)* G.P *(d)* H.P

(iv) A.M between $2\sqrt{5}$ and $6\sqrt{5}$ is

(a) $3\sqrt{5}$ *(b)* $4\sqrt{5}$

(c) $5\sqrt{5}$ *(d)* $5\sqrt{10}$

(v) The basic Property of G.P is

(a) Common Difference *(b)* Common Ratio

(c) Common Factor *(d)* Common Divisor

(vi) If a, G, b, are in G.P. Then G is called.

(a) Geometric Mean *(b)* Arithmetic mean

(c) Harmonic Mean *(d)* Mean

(vii) *nth* term of a sequence is $2n-7$

Then *20th* term is.

(a) 30 (b) 31 (c) 32 (d) 33

Q.2- Attempt any Five of the following short questions.

(i) Write the next three terms of sequence

$1, 9, 25, \ldots$

(ii) Find the general term of an A.P whose *1st* term is 2 and the common difference is 5.

(iii) In an A.P , $a_1=3, d=4, a_n=59$

Find the number of terms.

(iv) If 3 and 6 are two A.Ms between a and b. Find a and b.

(v) Find the *pth* term of G.P $x, x^3, x^5, \ldots$

(vi) Insert two G.Ms between 4 and $\frac{1}{2}$

(vii) Find the *nth* term of sequence

$$\left(\frac{3}{5}\right)^3, \left(\frac{3}{7}\right)^3, \left(\frac{3}{9}\right)^3, \ldots$$

Q.3- Attempt any two questions of the following $2\times4=8$

(i) Find *15th* term of an A.P, where *3rd* term is 8 and the common difference is $\frac{1}{3}$

(ii) Insert four real G.Ms between 3 and 96.

(iii) Insert three A.Ms between 11 and 19.

◆

UNIT 8

SETS AND FUNCTIONS

SHORT QUESTIONS

Q.1- Define a set and write some well-known sets of numbers.

Ans:

Set:- A collection of well defined distinct objects is called a "Set". For example a collection of students of 9th class, members of a cricket team etc.

Sets of Numbers:-

Set of Natural Numbers = N = $\{1,2,3...\}$

Set of Whole Numbers = W = $\{0,1,2,3...\}$

Set of Integers = Z = $\{...-3,-2,-1,0,1,2,3...\}$

Set of Even Numbers = E = $\{...-4,-2,0,2,4...\}$

Set of Odd Numbers = O = $\{...-3,-1,1,3,5...\}$

Set of Prime Numbers = P = $\{2,3,5,7,11,13,17...\}$

Q.2- If A = {2,3,5,7,11}
B = {1,3,5,7,9}
Find A∪B and A∩B

Solution:-

$$A \cup B = \{2,3,5,7,11\} \cup \{1,3,5,7,9\}$$
$$= \{1,2,3,5,7,9,11\}$$
$$A \cap B = \{2,3,5,7,11\} \cap \{1,3,5,7,9\}$$
$$= \{3,5,7\}$$

Q.3- If A = {2,3,4,5}, B = {2,4,6,8}. Then find A – B and B – A.

Solution:-

$$A - B = \{2,3,4,5\} - \{2,4,6,8\}$$
$$= \{3,5\}$$
$$B - A = \{2,4,6,8\} - \{2,3,4,5\}$$
$$= \{6,8\}$$

Q.4- If U = {1,2,3,4,5,6,7}, A = {3,4,5}, B = {1,3,5,7} Find (A ∪ B)′ and (A ∩ B)′.

Solution:-

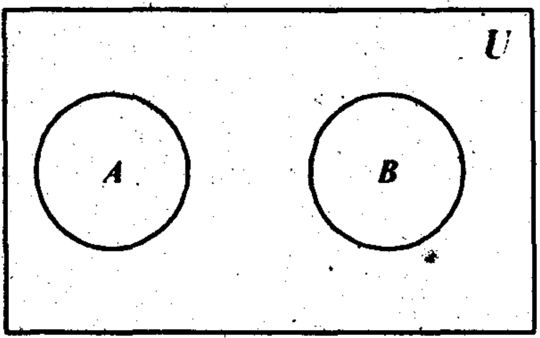
$$A \cup B = \{3,4,5\} \cup \{1,3,5,7\}$$
$$= \{1,3,4,5,7\}$$
$$(A \cup B)' = \cup - (A \cup B)$$
$$= \{1,2,3,4,5,6,7\} - \{1,3,4,5,7\}$$
$$= \{2,6\}$$
$$A \cap B = \{3,4,5\} \cap \{1,3,5,7\}$$
$$= \{3,5\}$$
$$(A \cap B)' = \cup - (A \cap B)$$
$$= \{1,2,3,4,5,6,7\} - \{3,5\}$$
$$= \{1,2,4,6,7\}$$

Q.5- Show two sets A and B by Veen Diagram When.

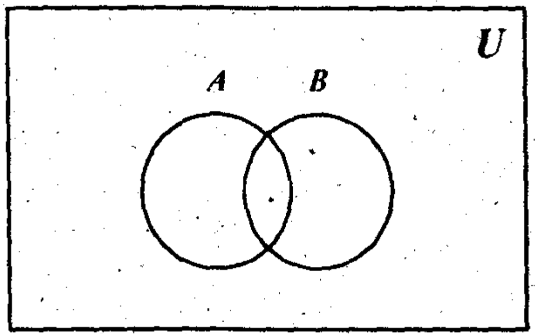
- ***(i)*** **They are disjoint**
- ***(ii)*** **They are overlapping**

Solution:-

(i) The figure shows that *A* and *B* are disjoint.



(ii) The figure given below shows that A and B are overlapping.



Q.6- State De-Morgan's Laws.

Ans. These laws state that

(i) $(A \cup B)^c = A^c \cap B^c$

(ii) $(A \cap B)^c = A^c \cup B^c$

Q.7- If A = {3,5,6}, B = {1,3} then find A×B and B×A.

Ans. $A \times B = \{3,5,6\} \times \{1,3\}$

$= \{(3,1),(3,3),(5,1),(5,3),(6,1)(6,3)\}$

$B \times A = \{1,3\} \times \{3,5,6\}$

$= \{(1,3),(1,5),(1,6),(3,3),(3,5),(3,6)\}$

Q.8- Defind a binary relation from a set A to set B.

Ans. If A and B are two non empty sets then any subset of $A \times B$ is called a binary relation from A to B.

Q.9- If A = {1,2,3}, B = {3,4}. Find any two binary relations from A to B.

Ans. $A \times B = \{(1,3),(1,4),(2,3),(2,4),(3,3),(3,4)\}$

$R_1 = \{(1,3),(2,4),(3,3)\}$

$R_2 = \{(1,4),(3,4)\}$

Q.10- Define Domain and Range of a binary relation.

Ans. It R is a binary relation. Then Domain of R is the set of all first elements of ordered pairs in R. The set of all second elements of ordered pairs in R is called Range of R.

Example:

$R = \{(1,3),(2,4),(3,5),(4,6),\}$

Dom $R = \{1,2,3,4,\}$

Rng $R = \{3,4,5,6,\}$

Q.11- Define a function from a set A to the set B.

Ans. Let A and B are two non empty sets and f is a binary relation fron A to B such that

(i) Domain. $f = A$

(ii) There is no repetition in the first elements of ordered pairs in f. Then f is said to be a function from A to B. It is expressed as $f: A \rightarrow B$

Q.12- Let $A = \{l, m, n\}, B = \{3,5,7\}$

Show that $f = \{(l,3),(m,3),(n,3)\}$ is a funtion from A to B.

Solution:-

(i) Domain $f = \{l,m,n\} = A$

First condition is satisfied.

(ii) All the three ordered pairs in f have different first elements and there is no repetition of first elements.

So *2nd* condition is also satisfied.

Thus f is a funtion from A to B

Q.13- Define an into function?

Solution:-

Let f be a function from A to B then f is called a funtion from A into B if

Range of $f \neq B$

Example:

If $A = \{a,b,c\}$, $B = \{x,y\}$

Then $f = \{(a,x),(b,x),(c,x)\}$ is an into funtion (from A into B)

Q.14- Define an Onto function.

Ans. Let f be a function from A to B such that

Range : $f = B$.

Then f is called a funtion from A onto B.

Example:

Let $A = \{p,q,r\}$, $B = \{x,y,z\}$

Then $f = \{(p,x),(q,y),(r,z)\}$ is a funtion from A onto B

Because, Range $f = \{x,y,z\} = B$

Q.15- Define a one-one function.

Ans. Let $f : A \rightarrow B$ is a function such that second element of each ordered pairs in f is also not repeated.

Example:

$f = \{(a,x),(b,y),(c,z)\}$

It is a one-one function.

Q.16- Let $X = \{7,8,9\}$, $Y = \{d,e,f\}$ and $h = \{(7,e),(8,d),(9,f)\}$

Show that h is a one-one funtion from A onto B.

Solution:-

(i) Domain $h = \{7,8,9\} = X$

(ii) No first element is repeated in *h*. So h is a function from *x* to *y*.

(iii) Range : $h = \{d,e,f\} = Y$

So *h* is an onto function.

Now again non of the second elements is repeated.

So this function is one-one function.

SOLVED EXERCISES

EXERCISE 8.1

Q.1- If $A = \{1,4,7,8\}$, $B = \{4,6,8,9\}$ and $C = \{3,4,5,7\}$ Find:

***(i)* $A \cup B$ *(ii)* $B \cup C$ *(iii)* $A \cap C$ *(iv)* $A \cap (B \cap C)$**

***(v)* $A \cup (B \cup C)$ *(vi)* $A \cap (B \cap C)$**

Solution:-

(i) $A \cup B = \{1, 4,7,8\} \cup \{4, 6,8,9\} = \{1, 4,6,7,8,9\}$ Ans.

(ii) $B \cup C = \{4,6,8,9\} \cup \{3,4,5,7\} = \{3,4,5,6,7,8,9\}$ Ans.

(iii) $A \cap C = \{1,4,7,8\} \cap \{3,4,5,7\} = \{4,7\}$ Ans.

(iv) $A \cap (B \cap C) = ?$

$(B \cap C) = \{4,6,8,9\} \cap \{3,4,5,7\} = \{4\}$

Now $A \cap (B \cap C)$

$= \{1,4,7,8\} \cap \{4\} \quad \because (B \cap C) = \{4\} = \{4\}$ Ans.

(v) $(A \cup B) \cup C = ?$

$(A \cup B) = \{1,4,7,8\} \cup \{4,6,8,9\} = \{1,4,6,7,8,9\}$

Now

$(A \cup B) \cup C = \{1,4,6,7,8,9\} \cup \{3,4,5,7\}$

$= \{1,3,4,5,6,7,8,9\}$ Ans.

(vi) $(A \cap B) \cap C = ?$

$A \cap B = \{1,4,7,8\} \cap \{4,6,8,9\} = \{4,8\}$

Now $(A \cap B) \cap C = \{4,8\} \cap \{3,4,5,7\} = \{4\}$ Ans.

Q.2- If $A = \{1,7,11,15,17,21\}$, $B = \{11,17,19,23\}$ and $C = \{2,3,5\}$.

Verify that: $(A \cap B) \cap C = A \cap (B \cap C)$

Solution:-

$A \cap B = \{1,7,11,15,17,21\} \cap \{11,17,19,23\}$

$A \cap B = \{11,17\}$

Now $(A \cap B) \cap C = \{11,17\} \cap \{2,3,5\}$

$(A \cap B) \cap C = \{\} = \phi \ldots (1)$

Now $B \cap C = \{11,17,19,23\} \cap \{2,3,5\} = \{\} = \phi$

$A \cap (B \cap C) = \{1,7,11,15,17,21\} \cap \phi$

$A \cap (B \cap C) = \phi \ldots (2)$

Results *(1)* and *(2)* show that

$(A \cap B) \cap C = A \cap (B \cap C)$

Q.3- If $A = \{2,4,6\}$, $B = \{3,6,9,12\}$ and $C = \{4,6,8,10\}$ verify that: $A \cup (B \cup C) = (A \cup B) \cup C$

Solution:-

$A = \{2,4,6\}$, $B = \{3,6,9,12\}$

$C=\{4,6,8,10\}$

We have to show that $A\cup(B\cup C)=(A\cup B)\cup C$

To solve the L.H.S.

$B\cup C=\{3,6,9,12\}\cup\{4,6,8,10\}$

$=\{3,4,6,8,9,10,12\}$

$A\cup(B\cup C)=\{2,4,6\}\cup\{3,4,6,8,9,10,12\}$

$A\cup(B\cup C)=\{2,3,4,6,8,9,10,12\}$ ...(1)

Now to solve the R.H.S. Consider

$A\cup B=\{2,4,6\}\cup\{3,6,9,12\}$

$A\cup B=\{2,3,4,6,9,12\}$

$(A\cup B)\cup C=\{2,3,4,6,9,12\}\cup\{4,6,8,10\}$

$(A\cup B)\cup C=\{2,3,4,6,8,9,10,12\}$ ...(2)

Results (1) and (2) show that

$A\cup(B\cup C)=(A\cup B)\cup C$

Q.4- If $A=\{2,3,5,7,9\}$, $B=\{1,3,5,7\}$
and $C=\{2,3,4,5,6\}$
verify that: $(A\cap B)\cap C=A\cap(B\cap C)$

Solution:- We are given that

$A=\{2,3,5,7,9\}$, $B=\{1,3,5,7\}$

$C=\{2,3,4,5,6\}$

We have to prove that

$(A\cap B)\cap C=A\cap(B\cap C)$

First we will solve L.H.S. Consider

$A\cap B=\{2,3,5,7,9\}\cap\{1,3,5,7\}=\{3,5,7\}$

$(A\cap B)\cap C=\{3,5\}$ ...(1)

Now we will solve R.H.S. Consider

$B\cap C=\{1,3,5,7\}\cap\{2,3,4,5,6\}$

$B\cap C=\{3,5\}$

Now $A\cap(B\cap C)=\{2,3,5,7,9\}\cap\{3,5\}$

$A\cap(B\cap C)=\{3,5\}$ ....(2)

Results (1) and (2) show that

$(A\cap B)\cap C = A\cap(B\cap C)$

Q.5- If $U=\{7,8,9,10,11,12,13,14\}$

$A=\{7,10,13,14\}$

and $B=\{7,8,11,12\}$ then

verify $(A\cap B)^0 = A^0\cup B^0$

Solution:- We are given that

$U=\{7,8,9,10,11,13,14\}$

$A=\{7,10,13,14\}$

$B=\{7,8,11,12\}$

We are to verify $(A\cap B)^C = (A^C\cup B^C)$

To solve L.H.S.

$A\cap B=\{7,10,13,14\}\cap\{7,8,11,12\} \;=\{7\}$

$(A\cap B)^C = U-(A\cap B)$

$=\{7,8,9,10,11,12,13,14\}-\{7\}$

$(A\cap B)^C=\{8,9,10,11,12,13,14\}$ ...(1)

Now to solve R.H.S.

$A^c = U-A=\{7,8,9,\ldots 14\}-\{7,10,13,14\}$

$=\{8,9,11,12\}$

$B^c = U-B=\{7,8,9,\ldots 14\}-\{7,8,11,12\}$

$=\{9,10,13,14\}$

$A^c\cup B^c=\{8,9,11,12\}\cup\{9,10,13,14\}$

$A^c\cup B^c=\{8,9,10,11,12,13,14\}$ ...(2)

Results (1) and (2) show that

$(A\cap B)^c = A^c\cup B^c$

Q.6- If $U=\{4,6,8,9,10\}$ $A=\{4,6\}$ $B=\{6,8,9\}$

We are to verify De Morgans Laws

$(A\cup B)^C = A^C\cap B^C$ and $(A\cap B)^C = A^C\cup B^C$

Solution:-

First Consider $(A\cup B)^c = A^c\cap B^c$

To solve L.H.S.

$A \cup B = \{4,6\} \cup \{6,8,9\}$

$A \cup B = \{4,6,8,9\}$.

$(A \cup B)^c = U - (A \cup B)$

$= \{4,6,8,9,10\} - \{4,6,8,9\}$

$(A \cup B)^c = \{10\}$ ...(1)

Now to solve R.H.S.

$A^c = U - A = \{4,6,8,9,10\} - \{4,6\}$

$= \{8,9,10\}$

$B^c = U - B = \{4,6,8,9,10\} - \{6,8,9\}$

$= \{4,10\}$

Now $A^c \cup B^c = \{8,9,10\} \cap \{4,10\}$

$= \{10\}$ ...(2)

Results (1) and (2) show that

$(A \cup B)^c = A^c \cap B^c$

Now take De. Morgans 2nd law

$(A \cap B)^c = A^c \cup B^c$

To solve the L.H.S.

$A \cap B = \{4,6\} \cap \{6,8,9\} = \{6\}$

$(A \cap B)^c = U - (A \cap B)$

$= \{4,6,8,9,10\} - \{6\}$

$(A \cap B)^c = \{4,8,9,10\}$ ...(1)

Now

$A^c = U - A = \{4,6,8,9,10\} - \{4,6\}$

$= \{8,9,10\}$

$B^c = U - B = \{4,6,8,9,10\} - \{6,8,9\}$

$B^c = \{4,10\}$

$A^c \cup B^c = \{8,9,10\} \cup \{4,10\}$

$= \{4,8,9,10\}$ ...(2)

Results (1) and (2) show that

$(A \cap B)^c = A^c \cup B^c$

Q.7- **If** $U = \{1,2,3,4,5,6,7,8,9\}$
$A = \{2,3,6,9\}$
and $B = \{1,3,6,7,8\}$ **then**
verify $(A \cup B)^c = A^c \cap B^c$

Solution:- We are to prove that

$(A \cup B)^c = A^c \cap B^c$

To solve L.H.S.

$A \cup B = \{2,3,6,9\} \cup \{1,3,6,7,8\}$

$= \{1,2,3,6,7,8,9\}$

$(A \cup B)^c = U - (A \cup B)$

$= \{1,2,3,\ldots 9\} - \{1,2,3,6,7,8,9\}$

$(A \cup B)^c = \{4,5\} \ldots (1)$

Now to solve R.H.S.

$A^c = U - A = \{1,2,3,\ldots 9\} - \{2,3,6,9\}$

$= \{1,4,5,7,8\}$

$B^c = U - B = \{1,2,3,\ldots 9\} - \{1,3,6,7,8\}$

$= \{2,4,5,9\}$

$A^c \cap B^c = \{1,4,5,7,8\} \cap \{2,4,5,9\}$

$A^c \cap B^c = \{4,5\} \ldots (2)$

From (1) and (2). We get.

$(A \cup B)^c = A^c \cap B^c$

Q.8- **Fill in the blanks:**

(i) $A \cup A =$ ______ **(ii)** $A \cap A =$ ______
(iii) $A \cup \Phi =$ ______ **(iv)** $A \cap \Phi =$ ______
(v) $\Phi \cup \Phi =$ ______ **(vi)** $(A \cap B)' =$ ______
(vii) $(A \cap B)' =$ ______ **(viii)** $(A')'$ ______
(ix) $\Phi \cap \Phi$ ______ **(x)** $A \cap A' =$ ______

Solution:-

(i) $A \cup A = \underline{A}$ *(ii)* $A \cap A = \underline{A}$
(iii) $A \cup \Phi = \underline{A}$ *(iv)* $A \cap \Phi = \Phi$
(v) $\Phi \cap \Phi = \underline{\Phi}$ *(vi)* $(A \cap B)' = \underline{A' \cup B'}$

(vii) $(A\cup B)'=\underline{A'\cap B'}$ (viii) $(A')'=\underline{A}$

(ix) $\Phi\cap\Phi'=\underline{\Phi}$ (x) $A\cap A'=\underline{\Phi}$

EXERCISE 8.2

Q.1- If $A=\{3,5,6\}$, $A=\{1,3\}$, Find $A\times B$ and $B\times A$ also the domains and ranges of the two binary relations established at your own for each case.

Solution:-

$A=\{3,5,6\}$, $B=\{1,3\}$

$A\times B=\{(3,1),(3,3),(5,1),(5,3),(6,1),(6,3)\}$

$B\times A=\{(1,3),(1,5),(1,6),(3,3),(3,5),(3,6)\}$

Two binary relations in $A\times B$ are

$R_1=\{(3,1),(5,3),(5,1)\}$

$R_2=\{(3,1),(3,3),(5,3),(6,3)\}$

Dom $R_1=\{3,5\}$, Range $R_1=\{1,3\}$

Dom $R_2=\{3,5,6\}$, Range $R_2=\{1,3\}$

Two binary relations in $B\times A$ are

$R_3=\{(1,3),(1,6),(3,3)\}$

$R_4=\{(1,5),(3,5)\}$.

Dom $R_3=\{1,3\}$, Range $R_3=\{3,6\}$

Dom $R_4=\{1,3\}$, Range $R_4=\{5\}$

Q.2- If $A=\{-2,1,4\}$, then write two binary relations in a also write their domains and ranges.

Solution:-

$A=\{-2,1,4\}$

$A\times A=\{-2,1,4\}\times\{-2,1,4\}$

$=\{(-2,-2),(-2,1),(-2,4),(1,-2),(1,1)$

$(1,4),(4,-2),(4,1),(4,4)\}$

Now any subset of $A\times A$ is a binary relation in A.

Thus two binary relations are

$R_1=\{(-2,-2),(1,-2),(4,1)\}$

$R_2 = \{(-2,1),(1,1),(4,1)\}$

Dom R_1 = set of first elements of ordered pairs in R_1

$= \{-2,1,4\}$

Rang R_1 = set of 2nd elements of ordered pairs in R_1

$= \{-2,1\}$

Similarly.

Dom $R_2 = \{-2,1,4\}$, Rang $R_2 = \{1\}$

Q.3- Write the number of binary relations possible in each of following cases.

(i) In $C \times C$ when the number of elements in C is 3.

(ii) In $A \times B$ if the number of elements in set A is 3 and in set B is 4.

Solution:-

(i) Numbers of elements in $C = 3$

Numbers of elements in $C \times C = 3 \times 3 = 9$

So, number of binary relations in $C \times C$

= Number of all subsets of $C \times C$

$= 2^9$ Ans.

(ii) Numbers of elements in $A = 3$

Numbers of elements in $B = 4$

Thus Numbers of elements in $A \times B = 3 \times 4 = 12$

So, Number of all subsets of $A \times B = 2^{12}$

and number of all posible binary relations in

$A \times B = 2^{12}$ Ans.

Q.4- If. $L = \{1,2,3\}$, and $M = \{2,3,4\}$, then write a binary relation R such that

$R = \{(x,y)\, x \in L, y \in M \wedge y \leq x\}$

Also write Dom(R) and Range(R).

Solution:-

$L = \{1,2,3\}, \ M = \{2,3,4\}$

$L \times M = \{(1,2),(1,3),(1,4),(2,2),(2,3)$

$,(2,4),(3,2),(3,3),(3,4)\}$

Now $R=\{(x,y)/x\in L, y\in M \wedge y\leq x\}$

$R=\{(2,2),(3,2),(3,3)\}$

Dom(R) $=\{2,3\}$, Rng(R) $=\{2,3\}$

Q.5- If $X=\{0,3,5\}$ and $Y=\{2,4,8\}$, then establish any four binary relations in $X\times Y$.

Solution:-

$X\times Y=\{(0,2),(0,4),(0,8),(3,2),(3,4)$
$(3,8),(5,2),(5,4),(5,8)\}$

Binary relation in $X\times Y$ is any subset of $X\times Y$. So four binary relations in $X\times Y$ are.

$R_1=\{(0,2),(3,2),(5,2)\}$

$R_2=\{(0,4),(0,8),(3,2),(5,8)\}$

$R_3=\{(0,8),(3,4),(5,2)\}$

$R_4=\{(5,2),(5,4),(5,8)\}$

Q.6- If $A=\{a,b,c\}$ and $B=\{2,4,6\}$ and $f=\{(a,4),(b,4),(c,4)\}$ is a binary relation from $A\times B$ then show that "f" is a function from A into B

Solution:-

$f=\{(a,4),(b,4),(c,4)\}$

Dom $f=\{a,b,c\}=A$

Now we see that non of the 1st elements of ordered pairs in f is repeated. So f is a funtion from A to B.

Now Range$(f)=\{4\}\neq B$

It means f is a function from A into B.

Q.7- If $A=\{l,m,n\}$ and $B=\{2,4,6\}$ and $g=\{(l,3),(m,1),(n,1)\}$ is a binary relation in $A\times B$, then show that "g" is A into B function.

Solution:-

$g=\{(l,3),(m,1),(n,1)\}$

Dom $(g)=\{l,m,n\}=A$

We see that non of the first elements ordered pairs in g is repeated.

So g is a function from A to B.

Now Rng$(g) = \{1,3\} \neq B$

It shows that g is a funtion from A into B.

Q.8- If $A = \{1,3,5\}$ and $B = \{x,y,z\}$ and $g = \{(1,x),(3,y),(5,z)\}$ is a binary relation from $A \times B$, then show that "g" is A onto B function.

Solution:-

$g = \{(1,x),(3,y),(5,z)\}$

Dom $(g) = \{1,3,5\}$

Also non of 1st elemnets of ordered pairs in g is repeated . So g is a function from A to B.

Now Rng$(g) = \{x,y,z\} = B$.

It shows that g is a function from A onto B.

Review Exercise 8

Q.1- Encircle the correct answer.

(i) If A and B are two non-empty sets, then $A \cup B =$?

(a) Φ *(b)* $B \cup A$ *(c)* $A \cap B$ *(d)* $B \cap A$

(ii) If A and B are two non-empty overlapping sets, then $A \cap B =$?

(a) Φ *(b)* $B \cap A$ *(c)* $A \cup B$ *(d)* $B \cup A$

(iii) For any two sets A and B, $A \cup B = B \cup A$ is called:

(a) Commutative law *(b)* Associative law

*(c)*De-morgan's law *(d)*Intersection of two sets

(iv) $A \cup (B \cup C) = (A \cup B) \cup C$ is called

(a) Commutative law *(b)* Associative law

*(c)*De-morgan's law *(d)*Intersection of sets

(v) If $U = \{1,2,3,4\}$, $A = \{4\}$, then $A' =$?

(a) $\{1,2,3\}$ *(b)* Φ *(c)* $\{1\}$ *(d)* $\{1,2,3,4\}$

(vi) If $U = \{1,2,3\}$, $A = \{1\}$, then $U - A = ?$

(a) $\{2,3\}$ (b) $\{1,2\}$

(c) $\{1,3\}$ (d) Φ

(vii) $(A \cup B)' = ?$

(a) $A' \cup B'$ (b) $A' \cap B'$

(c) $(A \cap B)'$ (d) Φ

(viii) $(A \cap B)' = ?$

(a) $A' \cap B'$ (b) $A' \cup B'$

(c) $A \cap B$ (d) $A \cup B$

(ix) If $R = \{(4,5),(5,4),(5,6),(6,4)\}$ then domain of R.

(a) $\{4,6\}$ (b) $\{4,5\}$ (c) $\{4,5,6\}$ (d) $\{5,6\}$

(x) If $R = \{(4,5),(5,4),(5,6),(6,4)\}$ then range of R is:

(a) $\{4\}$ (b) $\{5\}$ (c) $\{6\}$ (d) $\{4,5,6\}$

Ans.

(i) b	(ii) b	(iii) a	(iv) b	(v) a
(vi) a	(vii) b	(viii) b	(ix) c	(x) d

Q.2- Fill in the blanks.

(i) $(A \cup B)' =$ ____________

(ii) $(A \cap B)' = ?$ ____________

(iii) $A \cup (B \cup C) =$ ____________

(iv) $A \cap (B \cap C) =$ ____________

(v) If A and B be the two non-empty sets, then $A \cup B = B \cup A$ is called the ____________

(vi) If A and B be the two non-empty sets, then $A \cap B = B \cap A$ is callede ____________

(vii) Any sub-set of a cartesian product is called a ____________

(viii) If $R_1 = \{(1,2),(3,4),(5,6)\}$, then domain of R_1 is ______

(xi) If $R_1 = \{(1,2),(3,4),(5,6)\}$, then range of R_1 is ______

(x) If $f : A \to B$ then every element of a set A has its image in ____________

(i) $(A'\cap B')$	(ii) $A'\cup B'$
(iii) $(A\cup B)\cup C$	(iv) $(A\cap B)\cap C$
(v) Commutative Law	(vi) Commutative Law
(vii) Binary relation	(viii) $\{1,3,5\}$
(ix) $\{2,4,6\}$	(x) Set B

Q.3- If A={1,2,3,4,5,6}, B={2,3,4,6} and C={2,3,4,7,8,9}. Verify that : $(A\cap B)C = A\cap(B\cap C)$

Solution:-

$A=\{1,2,3,4,5,6\}, B=\{2,3,4,6\}$

$C=\{2,3,4,7,8,9\}$

We have to prove that

$(A\cap B)\cap C = A\cap(B\cap C)$

To solve L.H.S

$A\cap B=\{1,2,3,4,5,6\}\cap\{2,3,4,6\} =\{2,3,4,6\}$

$(A\cap B)\cap C=\{2,3,4,6\}\cap\{2,3,4,7,8,9\} =\{2,3,4\}$ ...(1)

Now to solve R.H.S

$B\cap C=\{2,3,4,6\}\cap\{2,3,4,7,8,9\} =\{2,3,4\}$

$A\cap(B\cap C)=\{1,2,3,4,5,6\}\cap\{2,3,4\} =\{2,3,4\}$ ...(2)

Results (1) and (2) show that $(A\cap B)\cap C = A\cap(B\cap C)$

Q.4- If A={2,3,4}, B={3,6,9,12} and C={4,6,8,10}. Verify that : $A\cup(B\cup C)=(A\cup B)\cup C$

Solution:-

$A=\{2,3,4\}, B=\{3,6,9,12\}$

$C=\{4,6,8,10\}$

We have to prove that

$A\cup(B\cup C)=(A\cup B)\cup C$

To solve L.H.S

$B\cup C=\{3,6,9,12\}\cup\{4,6,8,10\} =\{3,4,6,8,9,10,12\}$

$A\cup(B\cup C)=\{2,3,4\}\cup\{3,4,6,8,9,10,12\}$

$=\{2,3,4,6,8,9,10,12\}$ ...(1)

Now to solve R.H.S

$(A\cup B)=\{2,3,4\}\cup\{3,6,9,12\}$

$=\{2,3,4,6,9,12\}$

$(A\cup B)\cup C=\{2,3,4,6,9,12\}\cup\{4,6,8,10\}$

$=\{2,3,4,6,8,9,10,12\}$ ...(2)

Results (1) and (2) show that

$A\cup(B\cup C)=(A\cup B)\cup C$

Q.5- If A={2,3,4} and B={1,3}. Find $A\times B$ and $B\times A$. Also establish two binary relations each from these cartesian products.

Solution:-

$A=\{2,3,4\}, B=\{1,3\}$

$A\times B=\{2,3,4\}\times\{1,3\}$

$=\{(2,1),(2,3),(3,1),(3,3),(4,1),(4,3)\}$

Two binary relations in $A\times B$ are

$R_1=\{(2,1),(3,1),(4,1)\}$

$R_2=\{(2,3),(3,1),(3,3),(4,1)\}$

Now $B\times A=\{1,3\}\times\{2,3,4\}$

$=\{(1,2),(1,3),(1,4),(3,2),(3,3),(3,4)\}$

Two binary relations in $B\times A$ are

$R_3=\{(1,2),(1,4),(3,3)\}$

$R_4=\{(1,3),(1,4),(3,4),(3,2)\}$

Q.6- Write the number of binary relations possible in each of the following cases.

(i) In $C\times C$, when the number of elements in C are 4.

(ii) In $A\times B$, if number of elements in A are 2 and in B are 3.

Solution:-

(i) Number of elements in $C=4$

Number of elements in $C\times C=4\times 4=16$

Thus Number of all subsets of $C \times C = 2^{16}$

So Number of all Binary relaitons $= 2^{16}$

(ii) Number of elements of $A = 2$

Number of elements of $B = 3$

Number of elements of $A \times B = 2 \times 3 = 6$

Thus Number of all subsets of $A \times B = 2^6 = 64$

So Number of all binary relation in $A \times B = 64$

Q.7- If R = $\{(a,b)a,b \in W, 3a + 2b = 16\}$. Find its domain and range R.

Solution:-

$R = \{(a,b)a,b \in W, 3a + 2b = 16\}$

Consider the equation

$3a + 2b = 16$

Put $a = 0$, 2 and 4

For $a = 0 \Rightarrow b = 8 \Rightarrow (0,8) \in R$

For $a = 2 \Rightarrow b = 5 \Rightarrow (2.5) \in R$

For $a = 4 \Rightarrow b = 2 \Rightarrow (4,2) \in R$

Now $R = \{(0,8),(2,5),(4,2)\}$

Thus

Dom (R) $= \{0, 2, 4\}$

Rang (R) $= \{2, 5, 8\}$

Multiple Choice Question

Q.1- The set $\left[\frac{p}{q} : p,q \in z \wedge q \neq 0\right]$ is the set of

(a) Real Numbers *(b)* Rational Numbers

(c) Irrational Numbers *(d)* Prime Numbers

Q.2- Zero = 0 , is

(a) An even number *(b)* Odd numbers

(c) Imaginary numbers *(d)*. Irrational numbers

Q.3- $A \cup B =$

(a) $\{x / x \in A \vee x \in B\}$ (b) $\{x / x \in A \wedge x \in B\}$

(c) $\{x / x \in A \wedge x \notin B\}$ (d) $\{x / x \notin A \wedge x \in B\}$

Q.4- The set $\{x / x \in U \wedge x \notin A\}$ is equal to

(a) A (b) A^c (c) A' (d) $A - B$

Q.5- The set $\{x / x \in A \wedge x \notin B\}$ is equal to

(a) A^c (b) B^c (c) $A - B$ (d) $B - A$

Q.6- $A \cup (B \cup C) = (A \cup B) \cup C$ **is the law**

(a) De Morgan (b) Commutative

(c) Associative (d) Distributive

Q.7- In the venn diagram two sets A and B are such that

(a) $A \subseteq B$ (b) $B \subseteq A$ (c) Overlapping (d) Disjoint

Q.8- The statement $(A \cup B)^C = A^C \cap B^C$ is of

(a) Distributive law (b) Associative law

(c) De-Morgans law (d) Commutative law

Q.9- If $A = \{1,2,3,4,5,6\}$ and $U = \{1,2,3...10\}$

Then A^C is equal to

(a) $\{2,4,6,8,10\}$ (b) $\{1,3,5,7,9\}$

(c) $\{7,8,9,10\}$ (d) $\{1,2,3,4\}$

Q.10- If $A = \{1,2,3\}$, $B = \{y,z\}$, then all the binary relations in $A \times B$ are

(a) 6 (b) 9 (c) 32 (a) 64

Q.11- $R = \{(1,2),(1,3),(2,5),(3,10)\}$ is a binary relations.

Its Domain is

(a) $\{1,1,2,3\}$ (b) $\{1,2,3\}$

(c) $\{2,3,5,10\}$ (d) $\{1,2,3,5,10\}$

Q.12- If $A = \{a,b\}$, $B = \{x,y\}$, Then the function from A onto B is

(a) $\{(a,x),(b,x)\}$ (b) $\{(b,x), (a,y)\}$

(c) $\{(a,x), (a,y)\}$ (d) $\{(b,x),(b,y)\}$

Q.13- If f is a function from A to B such that Rang F = B Then it is a function

(a) Into *(b)* Onto

(c) One-One *(d)* Correspounding

Q.14- A one-one and onto function is called

(a) Injective *(b)* Surjective

(c) Bijective *(d)* Objective

Q.15- If A and B are disjoint sets then

(a) $A \cap B' = \Phi$ *(b)* $A \cup B = \Phi$

(c) $A^c = B$ *(d)* $B^c = A$

MODEL CLASS TEST

Time : 40 mins Max Marks : 25

Q.1- Tich the best choice.

(i) The law $A \cup B = B \cup A$ is called

(a) De-Morgan *(b)* Associative

(c) Commutative *(d)* Distributive

(ii) If $R = \{(1,3),(1,4),(2,3)\}$ Then $Dom(R) =$

(a) $\{1,1,2\}$ *(b)* $\{1,2\}$

(c) $\{3,3,4\}$ *(d)* $\{3,4\}$

(iii) If "f" is a function , such that non of 2nd element of ordered pairs in f is repeated. Then f is called

(a) Onto *(b)* into *(c)* One-One *(d)* Bijective.

(iv) Complement of universal set is equal to

(a) Universal set *(b)* Empty set

(c) Sub set *(d)* Super set

(v) $(A \cup B)^c$ is equal to

(a) $A^c \cup B^c$ *(b)* $(A \cap B)^c$

(c) $A^c \cap B^c$ *(d)* Φ

(vi) $A \cup \Phi$ is equal to .

(a) A *(b)* Φ *(c)* $A \cap \Phi$ *(d)* A^c

(vii) $\{2,4\}\cap\{1,3,5\}$ is equal to

(a) $\{3\}$ (b) $\{1,2,4\}$ (c) Φ (d) $\{1,2,3,4,5\}$

Q.2- Attempt any five of the following short questions.

(i) If $A=\{a,b,c\}$ and $B=\{a,e,i,o,u\}$

Then find $A\cup B$ and $A\cap B$

(ii) If $U=\{1,2,3,\ldots 10\}$ and $A=\{1,2,3,4\}$

Then find A^c

(iii) If $U=\{1,2,3,\ldots 10\}$ and $B=\{1,2,3,4\}$

Then find $B\cup B^c$.

(iv) If $R=\{(1,5),(2,6),(2,7),(3,7)\}$

Then find Dom(R) and Rng(R)

(v) If $A=\{5,6,7\}$, $B=\{1,2\}$ Then find the function from A onto B

(vi) If $A=\{a,b,c,d\}$ and $B=\{1,3\}$

Write a binary relation from A to B which is not a function.

Attempt any two of the following questions.

Q.3- If $U=\{1,2,3,\ldots 9\}$, $A=\{2,3,6,9\}$, $B=\{1,3,6,7,8\}$

Then verify $(A\cup B)^C=A^C\cap B^C$

Q.4- If $A=\{2,3,5,7,9\}$, $B=\{1,3,5,7\}$, $C=\{2,3,4,5,6\}$

Then verify $(A\cap B)\cap C=A\cap(B\cap C)$

Q.5- If $A=\{1,3,5\}$, $B=\{2,4,6\}$ Then find A× B and a b injective function from A to B.

◆

UNIT 9 LINEAR GRAPHS

SHORT QUESTIONS

Q.1- Find three points on the line whose equation is $y = 2x$

Solution:-

The given equation is $y = 2x$

For $x = 0$, $y = 2(0) = 0$

$\Rightarrow (0,0)$ is on the line.

For $x = 1$, $y = 2(1) = 2$

$\Rightarrow (1,2)$ is on the line.

For $x = 2$, $y = 2(2) = 4$

$\Rightarrow (2,4)$ is on the line.

Thus $(0,0),(1,2),(2,4)$ satisfy the equation $y = 2x$.

Q.2- Construct the table and draw the line whose equation is $y = 2x + 1$

Solution:-

Let us consider the equation $y = 2x + 1$

When $x = -2,\ y = 2(-2) + 1 = -3$

$x = -1,\ y = 2(-1) + 1 = -1$

$x = 0,\ y = 2(0) + 1 = 1$

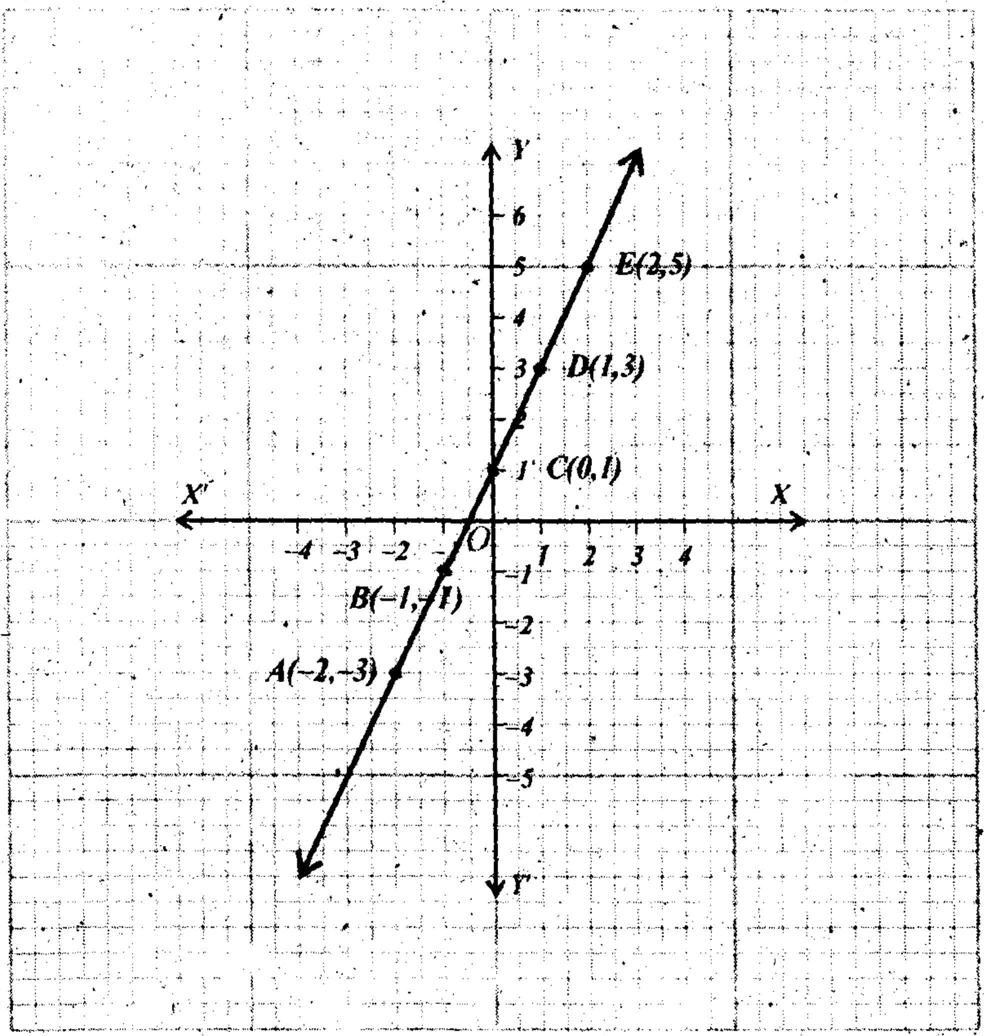
$x = 1,\ y = 2(1) + 1 = 3$

$x = 2,\ y = 2(2) + 1 = 5$

The following table shows five pairs of values of x and y mentioned above.

x	-2	-1	0	1	2
$y=2x+1$	-3	-1	1	3	5

We use 2 small squares $= 1$, along both x and y-axis.



Q.3- Draw the graph of $y=2x+6$.

Solution:-

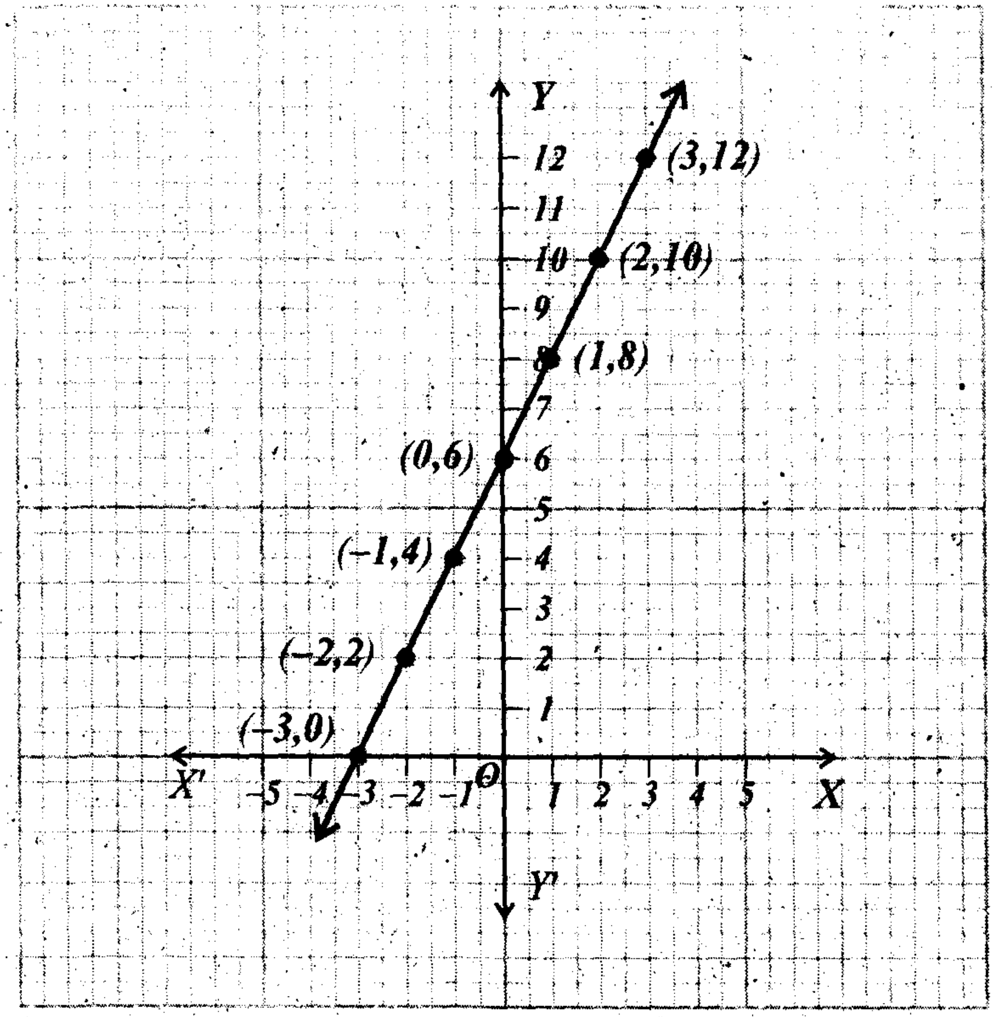
If we put $x=0$ in $y=2x+6$

We get $y=2(0)+6=6$ i. e $y=6$

Similarly putting $x=\pm 1, \pm 2, \pm 3, ...$

We get the value of y as shown in the table.

x	-3	-2	0	1	2	3
y	0	2	6	8	10	12



Q.4- Graph the equation x = −2

Solution:-

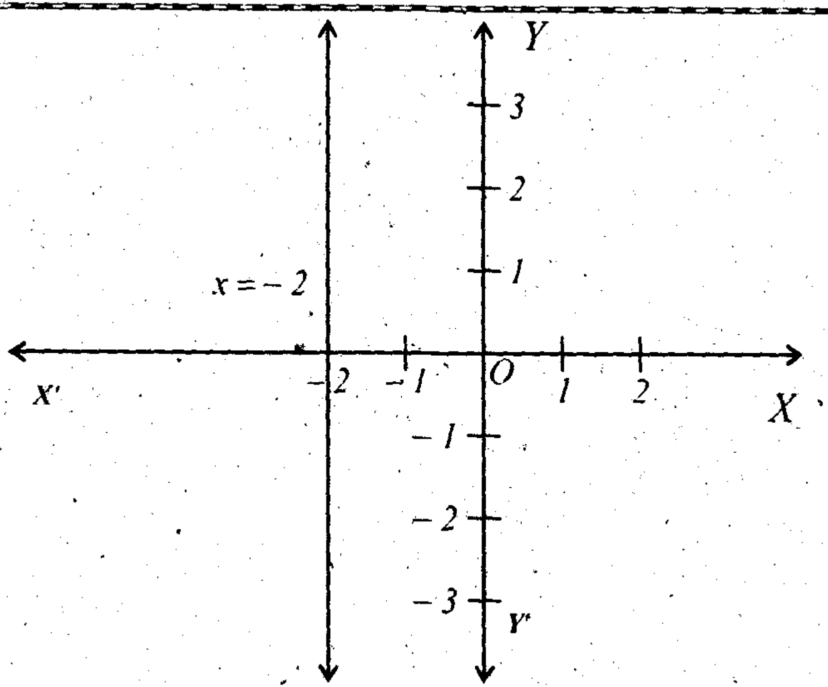
The equation $x=-2$ can be written as $x+0y=-2$, if we put $y=0$ in this equation, we get $x=-2$. Similarly putting $y=\pm 1,\pm 2,\pm 3,\ldots$

in the equation $x=+0$, $y=-2$, we have $x=-2$.

For all values of y we have $x=-2$, i.e. x remains constant.

Table of values of x and y is as under:

x	-2	-2	-2	-2	-2	-2	-2
y	-3	-2	-1	0	1	2	3

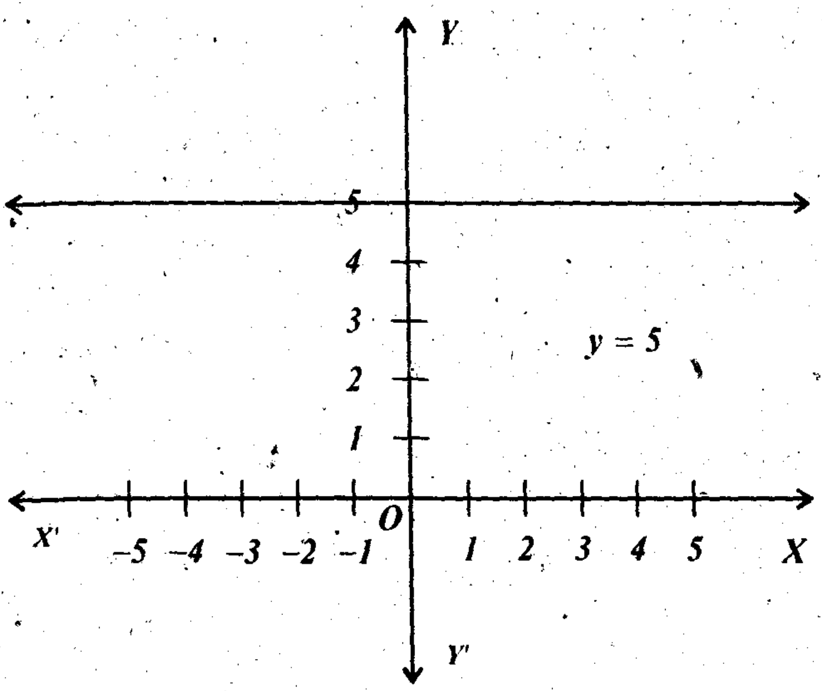


Q.5- Draw the graph of equation $y = 5$

Solution:-The equation $y = 5$ can be written as $y = 0 \times x + 5$

If we put $x = 0$ in the equation we get $y = 5$.Similarly putting $x = \pm 1, \pm 2, \pm 3, \ldots$ in the equation $y = 0, x + 5$, we have $y = 5$. For all values of x We have $y = 5$, i.e. y remains constant. Table of value of x and y is as under:

x	-3	-2	-1	0	1	2	3
y	5	5	5	5	5	5	5



Q.6- Define Domain and Range of a linear funtion.

Ans. A funtion is a set of ordered pair of the kind (x, y) where $x, y \in R$. The set of all suitable values of x is called Domain and the set of all suitable values of y is called Range of the function. Usually, in case of linear funtion.

Domain of funtion = Range of funtion.

And both of these are equal to the set of real numbers.

Q.7- Define integral subset of domain and integral subset of Range of a funtion.

Ans. The set of only suitable integral values of x for a linear function is called integral subset of Domain of the funtion.

Q.8- Draw the graph of y=2x+1 and find integral subsets of Domain and Rang of given funtion.

Solution:

The graph shown in the figure is of a function $y = 2x + 1$. This graph has been drawn with the help of the following ordered pairs. $A(-2, -3)$, $B(-1, -1)$ $C(0, 1)$, $D(1, 3)$ and $E(2, 5)$.

From these ordered pairs we construct a table consisting the value of x and y.

x	-2	-2	0	1	2
y	-3	-1	1	3	5

In a function $y = 2x + 1$, the set consisting of the values of x is called the domain and the set consisting the values of y is called the range of the function.

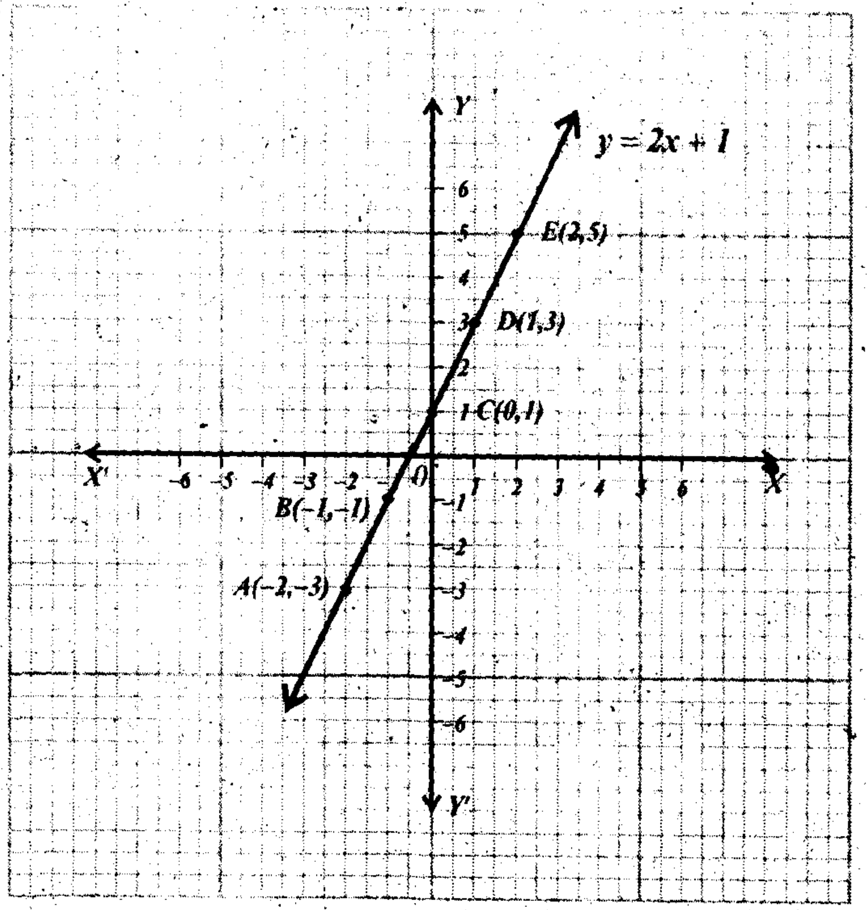
Thus for $y = 2x + 1$:

Integral subset of Domain of function

$= \{\ldots, -2, -1, 0, 1, 2, \ldots\}$

Integral subset of Range of function

$= \{\ldots,-3,-1,1,3,5,\ldots\}$



Q.9- What is meant by converssion graph?

Ans. Two different units of a single physical quantity can be intercoverted by a simple linear graph. The straight line used for this purpose is called the converssion graph.

Q.10- Define the term "Ordered Pair".

Ans. An ordered pair is a set of two elements in which order of elements is also important. Ordered pair of x and y is denoted as. (x,y)

Note that for two sets

$\{x,y\} = \{y,x\}$, but $(x,y) \neq (y,x)$

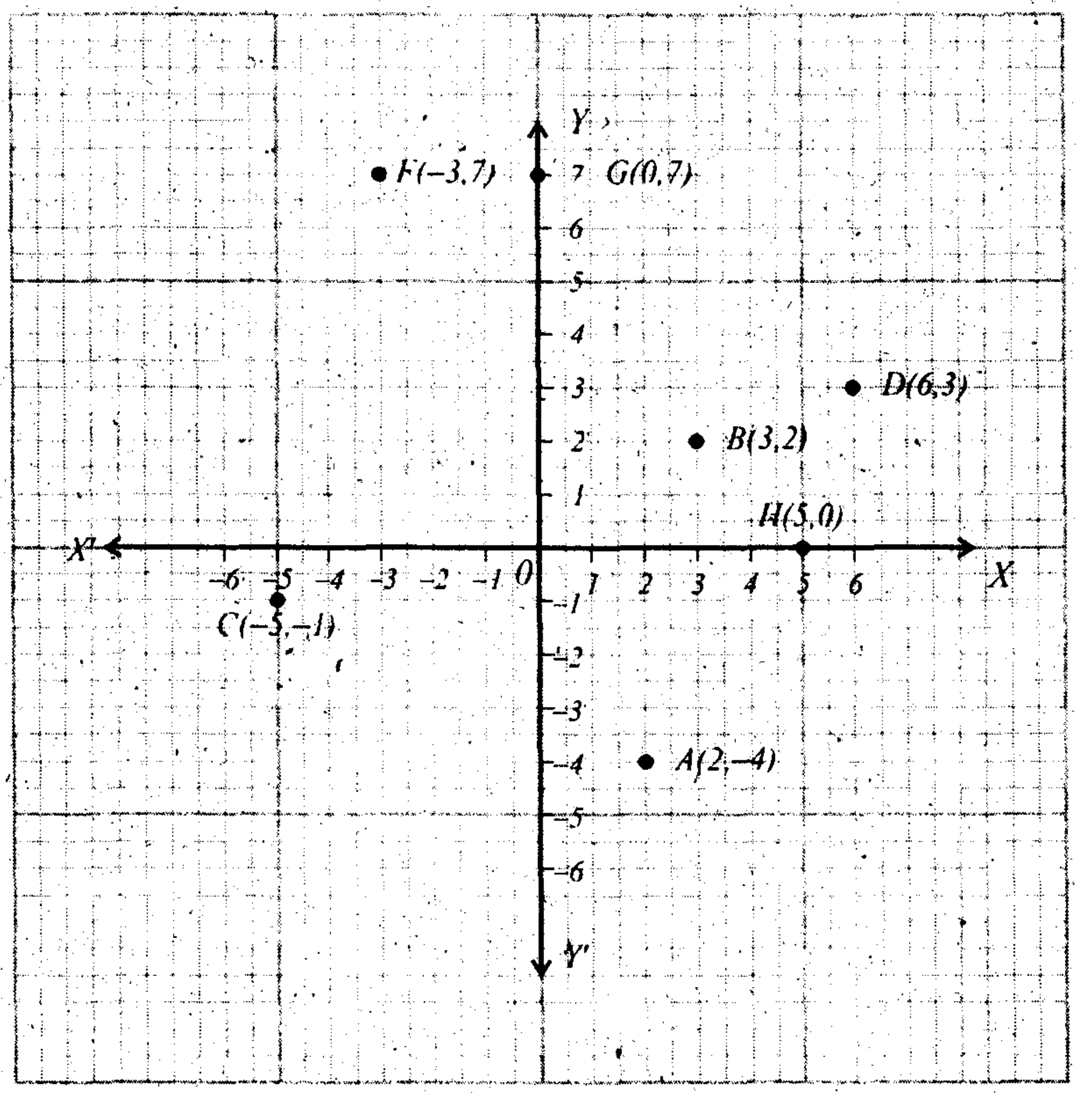
SOLVED EXERCISES

EXERCISE 9.1

Q.1- **Represent the points on the graph whose co-ordinates are given below.**

(i)	A(2, −4)	*(ii)*	B(3,2)
(iii)	C(−5,−1)	*(iv)*	D(6,3)
(v)	B(3,2)	*(vi)*	F(−3,7)
(vii)	G(0,7)	*(viii)*	H(5,0)

Solution:



Q.2- Write down the co-ordinates of:

(i) **Origin**

Ans. Co-ordinates of Origine $= (0, 0)$

(ii) **A point lying on the left hand side of x-axis and at a distance of 5 units from the origine.**

Ans. A point lying on left side of Origene on *x-axis* 5 units from Origine $= (-5, 0)$

(iii) **A point lying on the right hand side of the origine on x-axis at a distance of 3 units from the origine.**

Ans. A point on right side of Origine on *x-axis* at a distance of 3 units from the Origine $= (3, 0)$

(vi) **A point lying above x-axis and on y-axis at a distance of 4 units.**

Ans. A point above *x-axis* on *y-axis* at a distance of 4 units from Origine $= (0, 4)$

(v) **A point lying below x-axis and on y-axis at a distance of 6 units.**

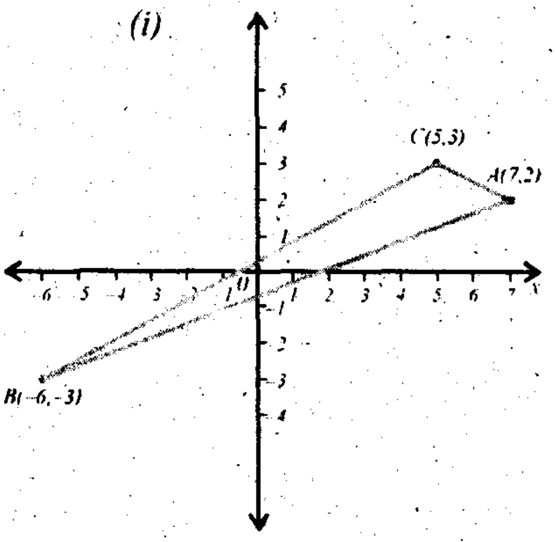
Ans. A point below *x-axis* and on *y-axis* 6 unit from Origine $= (0, -6)$

Q,3- **Draw the figures with help of the following points on the graph paper.**

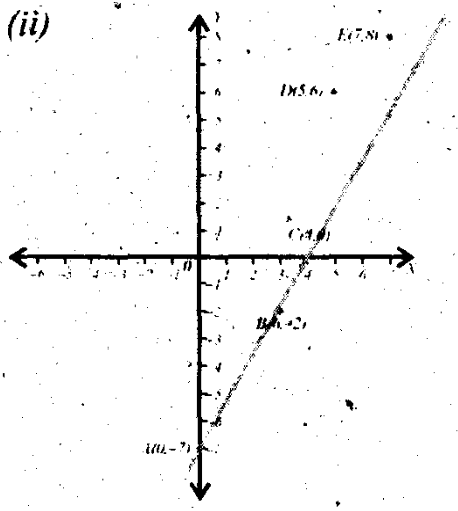
(i)	A(7, 2),	B(–6,–3),	C(5,3)		
(ii)	A(0, –7),	B(3,–2),	C(4,0),	D(5,6)	E(7,8)
(iii)	A(4, 0),	B(0,4),	C(–4,0)	D(0,–4)	
(iv)	A(10, 6),	B(–10,6),	C(–10,–6)	D(10,–6)	

Ans.

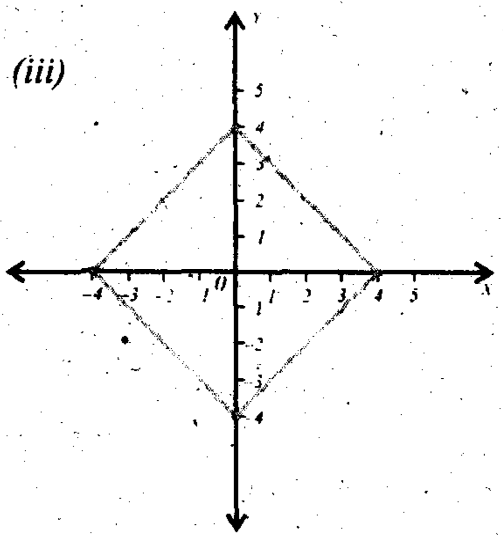
(i)



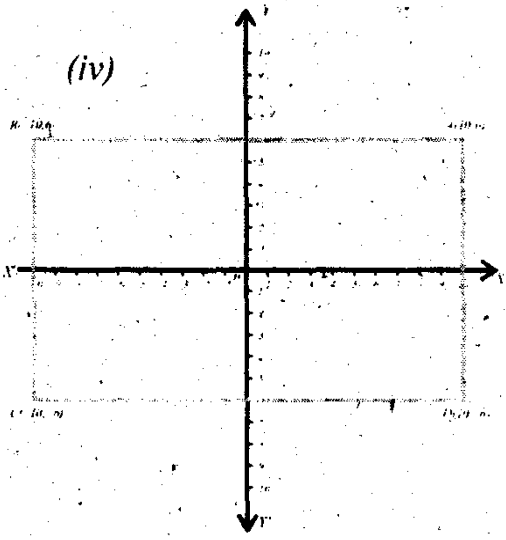
(ii)



(iii)



(iv)



EXERCISE 9.2

Q.1- Draw the graph of $y = 3x$

Solution:

In the given equation put

$x = -3, -2, -1, 0, 1, 2, 3$

We get the values of y as:

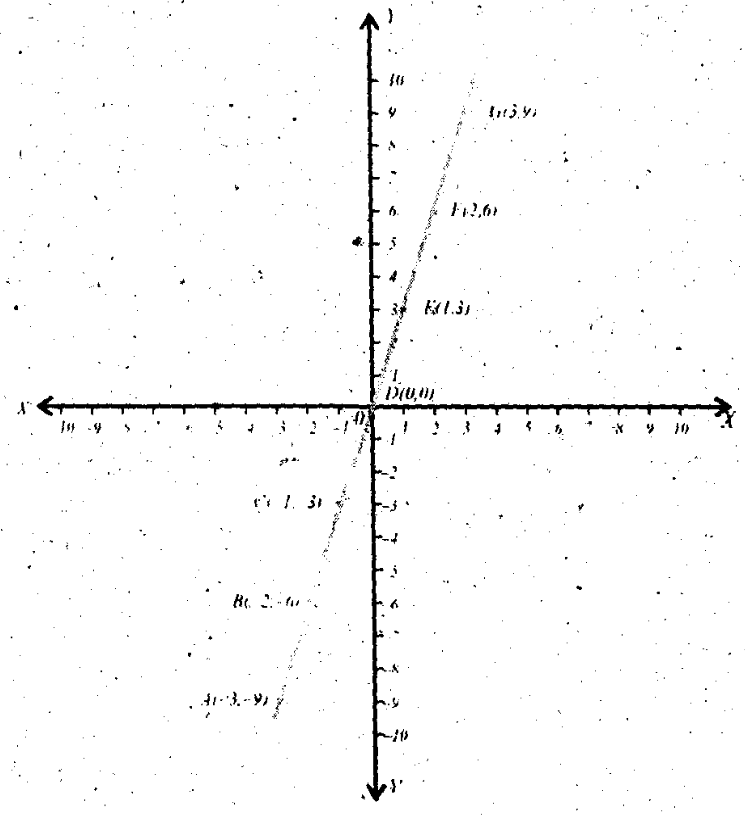
$y = -9, -6, -3, 0, 3, 6, 9$

So, We construct the table.

x	-3	-2	-1	0	1	2	3
y	-9	-6	-3	0	3	6	9

So locate the points

$(-3,-9), (-2,-6), (-1,-3), (0,0), (1,3), (2,6)$ and $(3,9)$ on the graph paper and join them to get a straight line as the required graph.



Q.2- Draw the graph of $y = x + 7$

Solution:

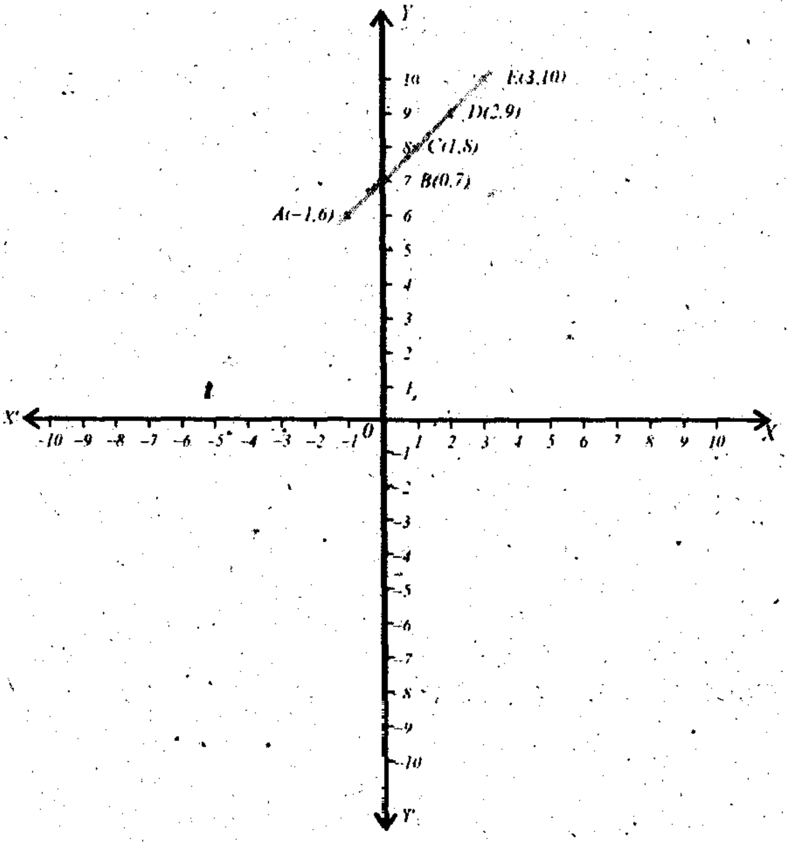
Replace x by the numbers $-4, -3, -2, -1, 0, 1, 2,$

We get the values of y as $3, 4, 5, 6, 7, 8, 9$.

So, We get the table.

x	-4	-3	-2	-1	0	1	2
y	3	4	5	6	7	8	9

On the graph paper locate the points $(-4,3),(-3,4),(-2,5),(-1,6),(0,7),(1,8),(2,9)$ and jion them to get the required strainght line.



Q.3- Draw the graph of $y = 2x - 3$

Solution:

In the given equation put the values of x.

$x = -3, -2, -1, 0, 1, 2, 3, 4, 5.$

We will get the values of y as:

$y = -9, -7, -5, -3, -1, 0, 1, 3, 5, 7$

Now we have the table.

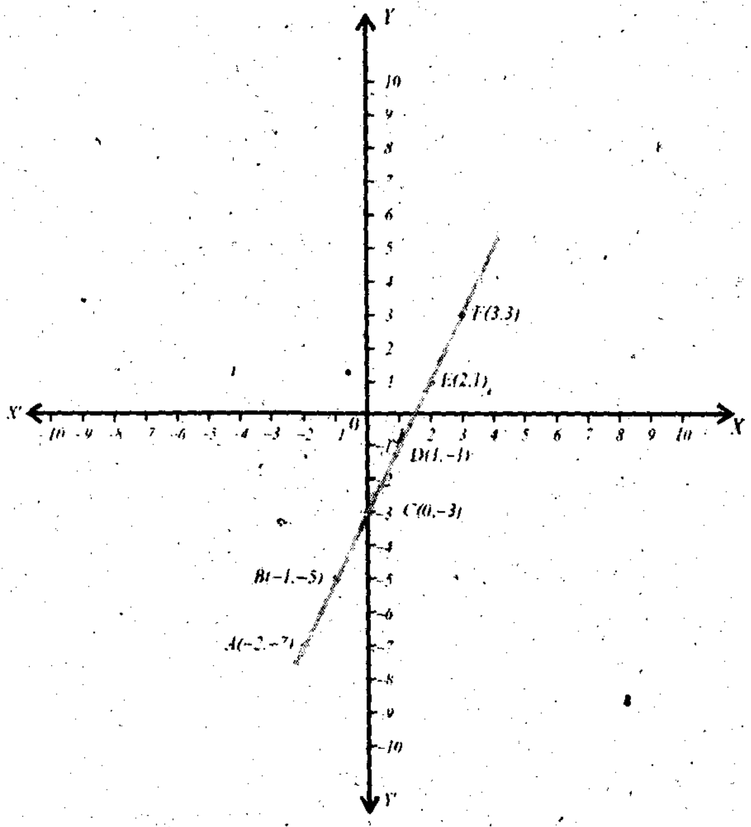
x	-3	-2	-4	0	1	2	3	4	5
y	-9	-7	-5	-3	-1	1	3	5	7

So the points on the line are

$(-3,-9),(-2,-7),(-1,-5),(0,-3),(1,-1),(2,1)$

$(3,3),(4,5),(5,7)$

Locate these points on the graph paper and draw the required strenght line.



Q.4- Draw the graph of $y = 4x + 1$

Solution:

Put the values of x in the given equation as:

$x = -2,-1,0,1,2,3$

We get $y = -7-3,1,5,9,13$

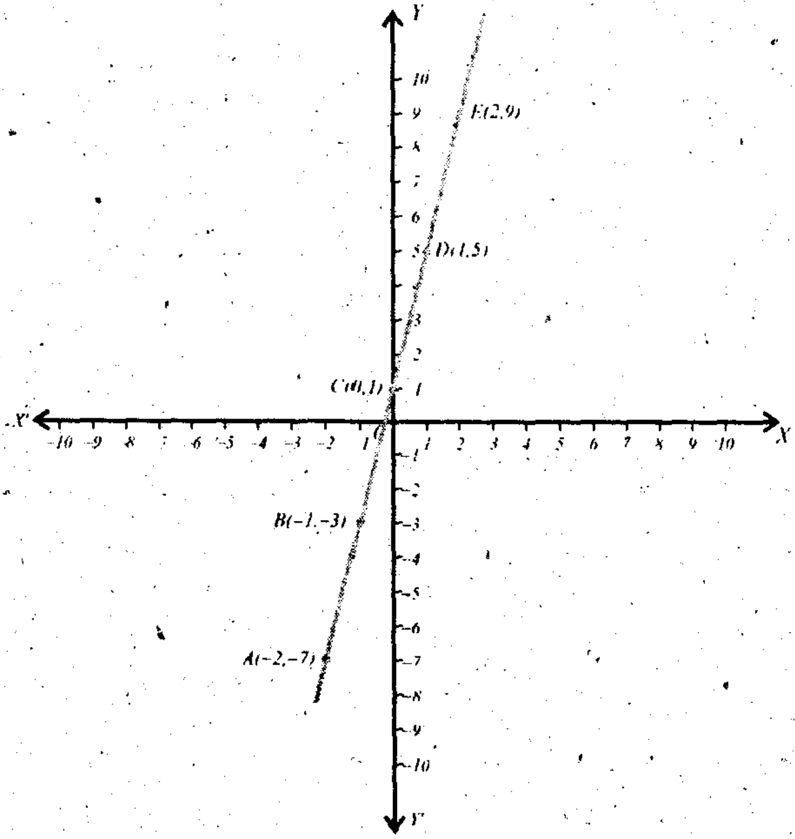
So the table of values is

x	-2	-1	0	1	2	3
y	-7	-3	1	5	9	13

The point on the graph are.

$(-2,-7),(-1,-3),(0,1),(1,5),(2,9)$ and $(3,13)$.

Draw these points on the graph and joint them to get the required line.



Q.5- Draw the graph of $y=-\frac{x}{2}-\frac{3}{2}$

Solution:

Replace x by numbers $-7, -5, -3, -1, 1, 3, 5$

We get the values of y as:

$y=2, 1, 0, -1, -2, -3, -4$

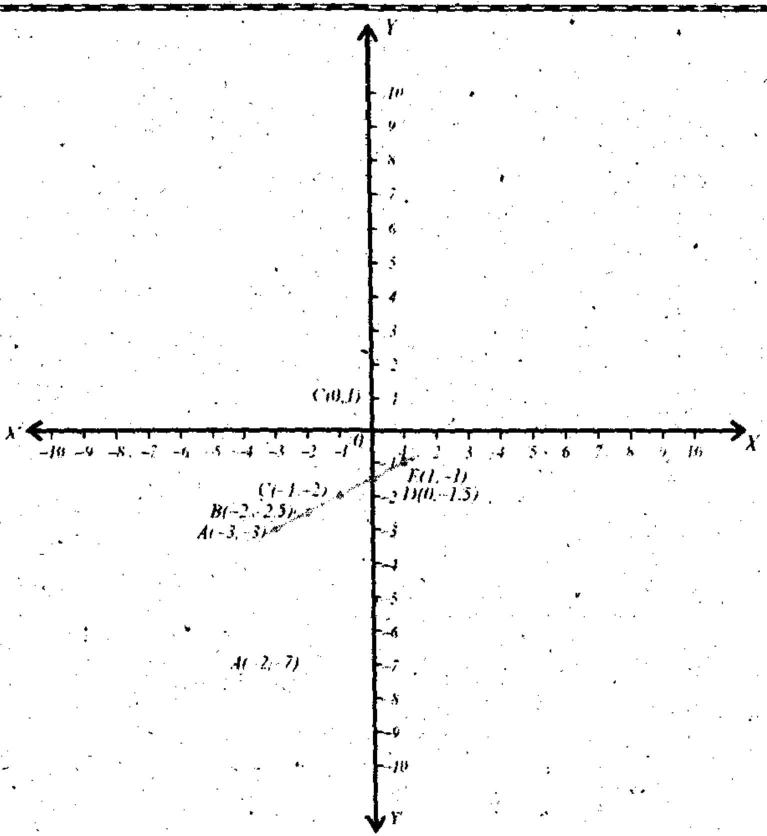
So, We get the table.

x	-7	-5	-3	-1	1	3	5
y	2	1	0	-1	-2	-3	-4

Thus the points on the line are.

$(-7,2),(-5,1),(-3,0),(-1,-1),(1,-2),(3,-3),(5,-4)$

Locate these points on graph and join them.



Q.6- Draw the graph of $y = x - 1$

Solution:

In the given equation.

Put $x = -2$ we get $y = -3$

Put $x = -1$ we get $y = -2$

Put $x = 0$ we get $y = -1$

For $x = 1$, $y = 0$

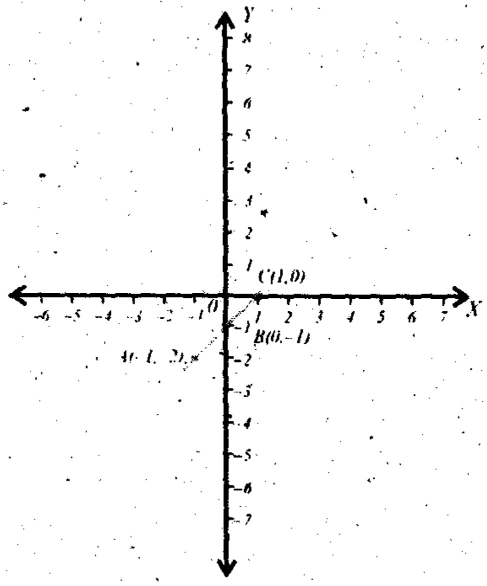
For $x = 2$, $y = 1$

For $x = 3$ $y = 2$

Thus the points on the line are

$(-1, -2), (0, -1), (1, 0), (2, 1), (3, 2)$

Locate these points on the graph and join them.

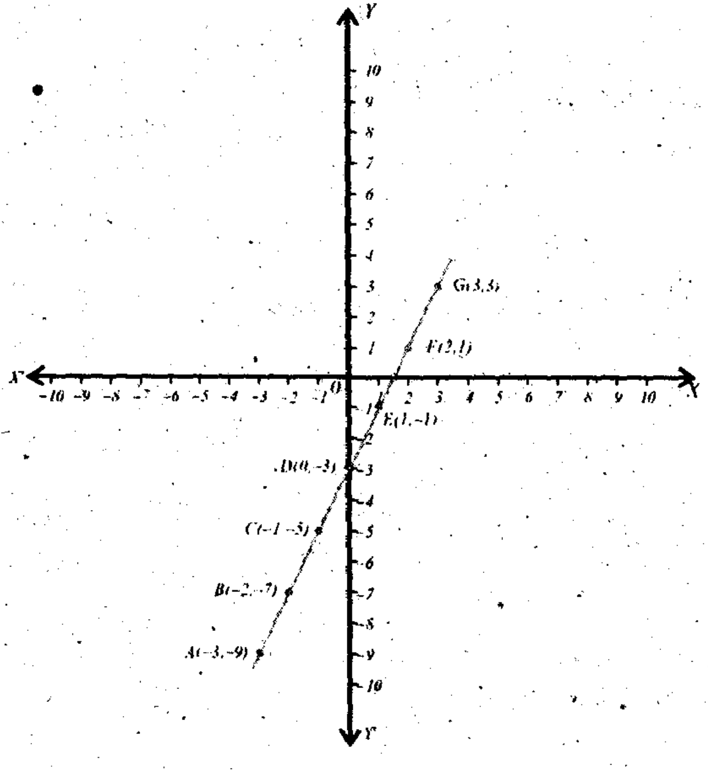


Q.7- Draw the graph of $y = 2x - 3$

Solution: Consider the equation $y = 2x - 3$

For $x = -2, y = -7 \Rightarrow (-2, -7)$ is on the line.
For $x = -1, y = -5 \Rightarrow (-1, -5)$ is on the line.
For $x = 0, y = -3 \Rightarrow (0, -3)$ is on the line.
For $x = 1, y = -1 \Rightarrow (1, -1)$ is on the line.
For $x = 2, y = 1 \Rightarrow (2, 1)$ is on the line.
For $x = 3, y = 3 \Rightarrow (3, 3)$ is on the line.

Thus locate these points on the graph and join them.



Q.8- Draw the graph of $y = 3x + 5$

Solution:

Consider the equation $y = 3x + 5$

For $x = -3, y = -4 \Rightarrow (-3, -4)$ is on the line.

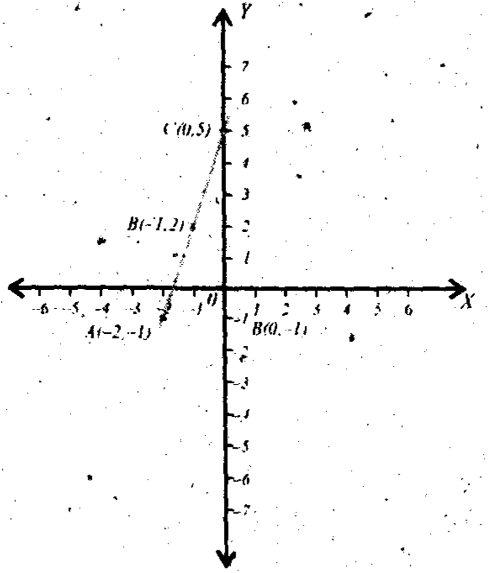
For $x = -2, y = -1 \Rightarrow (-2, -1)$ is on the line.

For $x = -1, y = 2 \Rightarrow (-1, 2)$ is on the line.

For $x = 0, y = 5 \Rightarrow (0, 5)$ is on the line.

For $x = 1, y = 8 \Rightarrow (1, 8)$ is on the line.

Now locate these points on the graph and join them.



Q.9- Draw the graph of $y = \frac{x}{2}$

Solution:

Consider the equation $y = \frac{x}{2}$

For $x = -4, y = -2 \Rightarrow (-4, -2)$ is on the line.

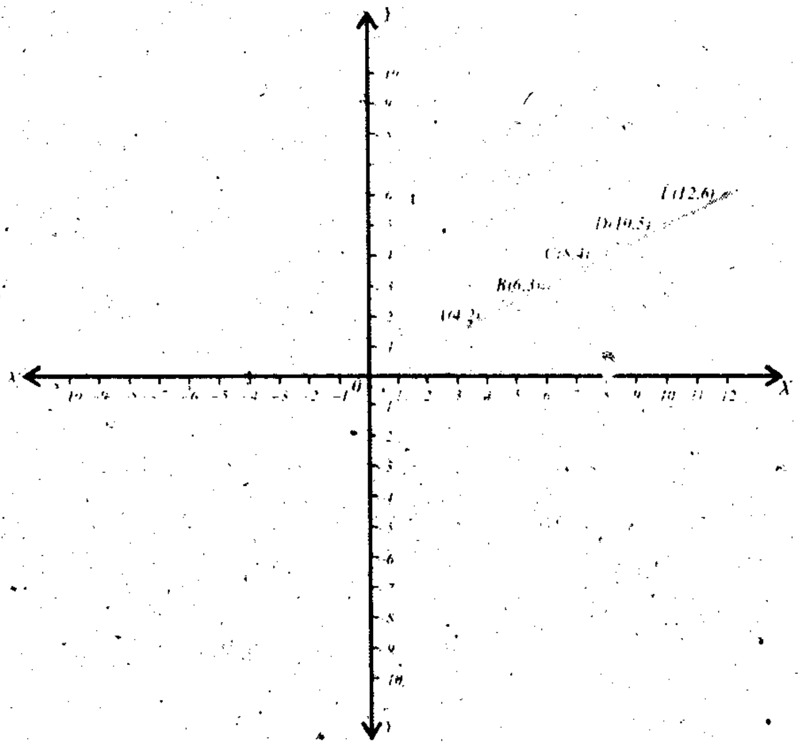
For $x = -2, y = -1 \Rightarrow (-2, -1)$ is on the line.

For $x = 0, y = 0 \Rightarrow (0, 0)$ is on the line.

For $x = 2, y = 1 \Rightarrow (2, 1)$ is on the line.

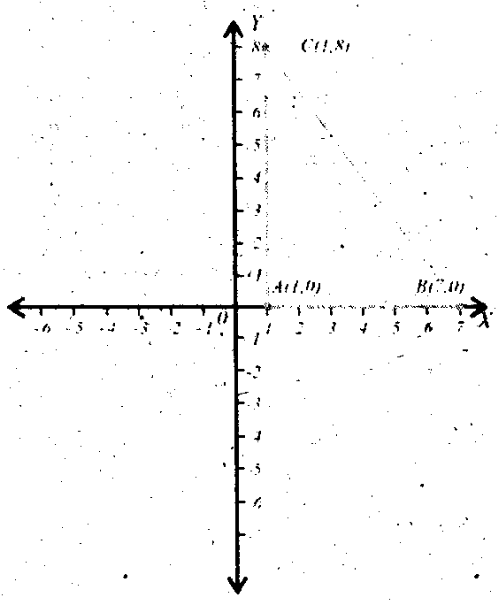
For $x = 4, y = 2 \Rightarrow (4, 2)$ is on the line.

Draw these points on the graph paper and join them.



Q.10- Draw the graph by plotting $A(1,0), B(7,0)$ and $C(1,8)$

Solution:



Q.11- Draw the graph from the given tables.

(i)

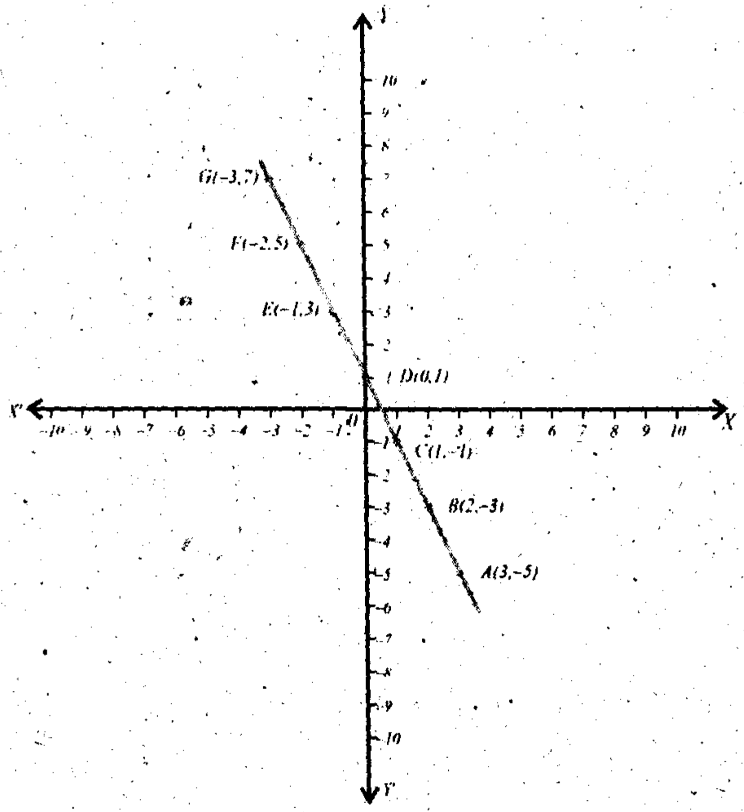
x	3	2	1	0	−1	−2	−3
y	−5	−3	−1	1	3	5	7

Solution: From the values of x and y given in the table.

We get the points

$(3,-5),(2,-3)(1,-1),(0,1),(-1,3),(-2,5),(-3,7)$

Draw these points on the graph and join them.



(ii)

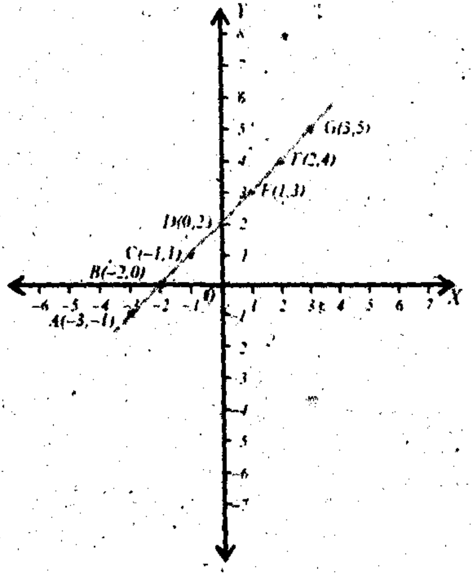
x	–3	–2	–1	0	1	2	3
y	–1	0	1	2	3	4	5

Solution: From the values of x and y given in the table.

We get the points

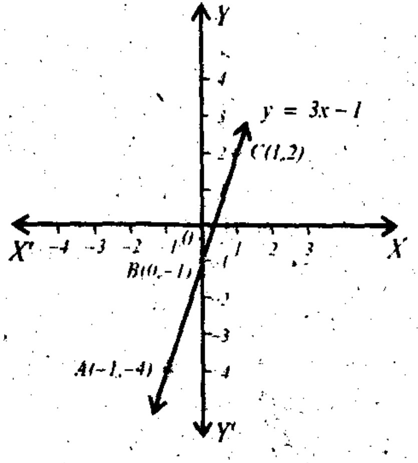
$(-3,-1),(-2,0),(-1,1)(0,2),(1,3),(2,4),(3,5)$

Locate these points on graph and draw the straight line



Identify through the given graphs the domain and the range of a function

Q.12-



Solution:

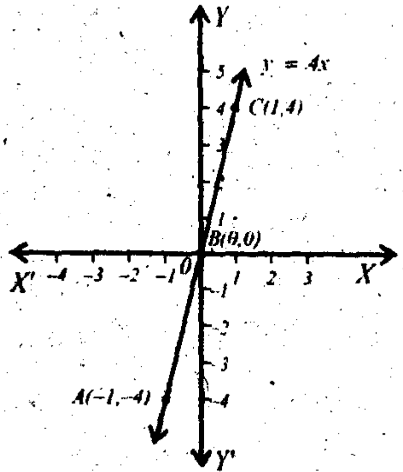
The integral subset of Domain =

The set of integral values of $x = \{\ldots,-1,0,1\ldots\}$

the integral sub set a range =

The set of integral values of $y = \{\ldots,-4,-1,2\ldots\}$

Q.13-



Solution:

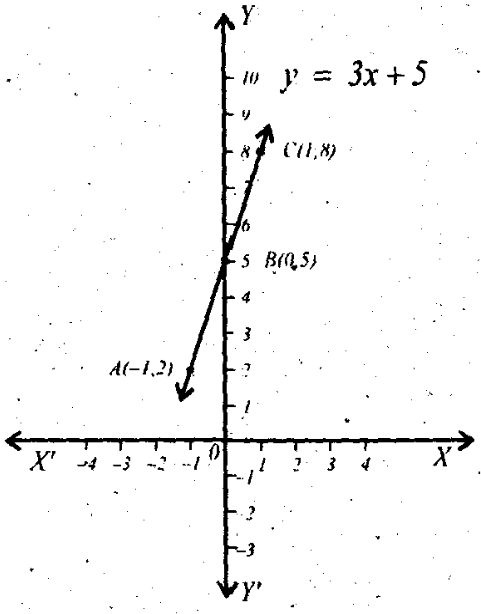
The integral subset of Domain =

The set of integral values of $x = \{\ldots,-2,-1,0,1,2\ldots\}$

the integral sub set a range =

The set of integral values of $y = \{\ldots,-4,0,4\ldots\}$

Q.14-



Solution:

The integral subsets of Domain and range are.

The set of integral values of $x = \{...,-2,-1,0,1,2...\}$

The set of integral values of $y = \{...,2,5,8...\}$

EXERCISE 9.3

Q.1- The table gives temperatures in dgrees Fahrenheit ^{0}F and the equivalent values in degrees Centigrade ^{0}C.

Temperatures in ^{0}F	**57**	**126**	**158**	**194**
Temperatures in ^{0}C	**14**	**52**	**70**	**90**

Plot these points on a graph paper for centigrade values from 0 to 100 and Fahrenheit value from 0 to 220. Let 5 small squares represent 20 units on each axis. Use your graph to convert the following:

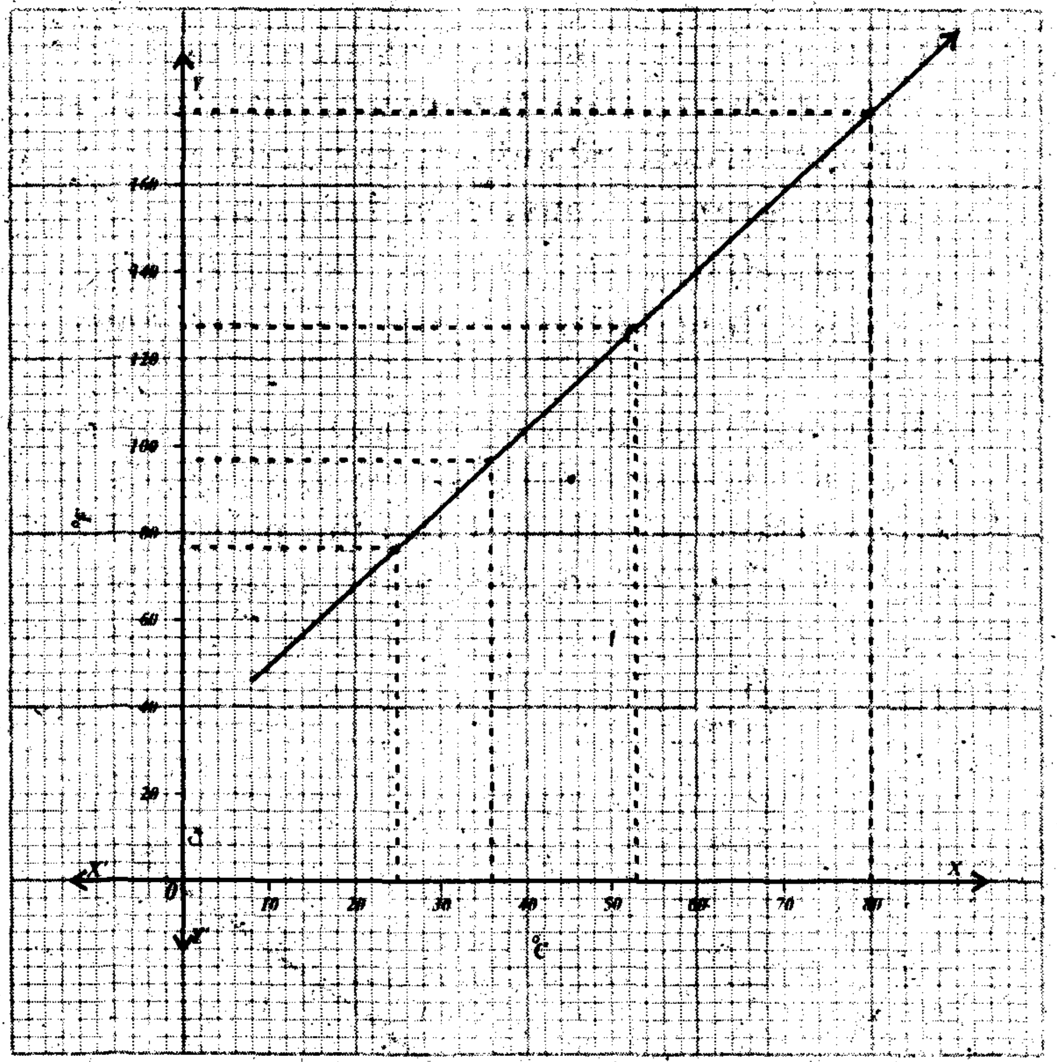
(a) 97 ^{0}F into ^{0}C (b) 127^{0}F into ^{0}C

(c) 25 ^{0}C into ^{0}F (d) 80 ^{0}C into ^{0}F

Solution:

According to the given scale, take Centigrade degree along *x-axis* and Fahrenheit values along *y-axis*.

The points $(14,57)$, $(52,126)$, $(70,158)$ and $(90,194)$ are given. Locate these points and joining them. Draw the straight line.



The graph shows that

(i) Corresponding to $97\ ^{0}F$, the points on the graph gives $(36.10)\ ^{0}C$

(ii) Similarly we can find $127\ ^{0}F = 52.8\ ^{0}C$

(iii) $25^{0}C = 77^{0}F$

(iv) $80^{0}C = 176^{0}F$

Q.2- The table shows the conversion from US Dollars (\$) to Pounds (£) for various amounts of money.

\$	50	100	200
£	35	70	140

Plot these points on a graph paper and draw a straight line to pass through them. Let 5 small squares represent 50 units on each exis.

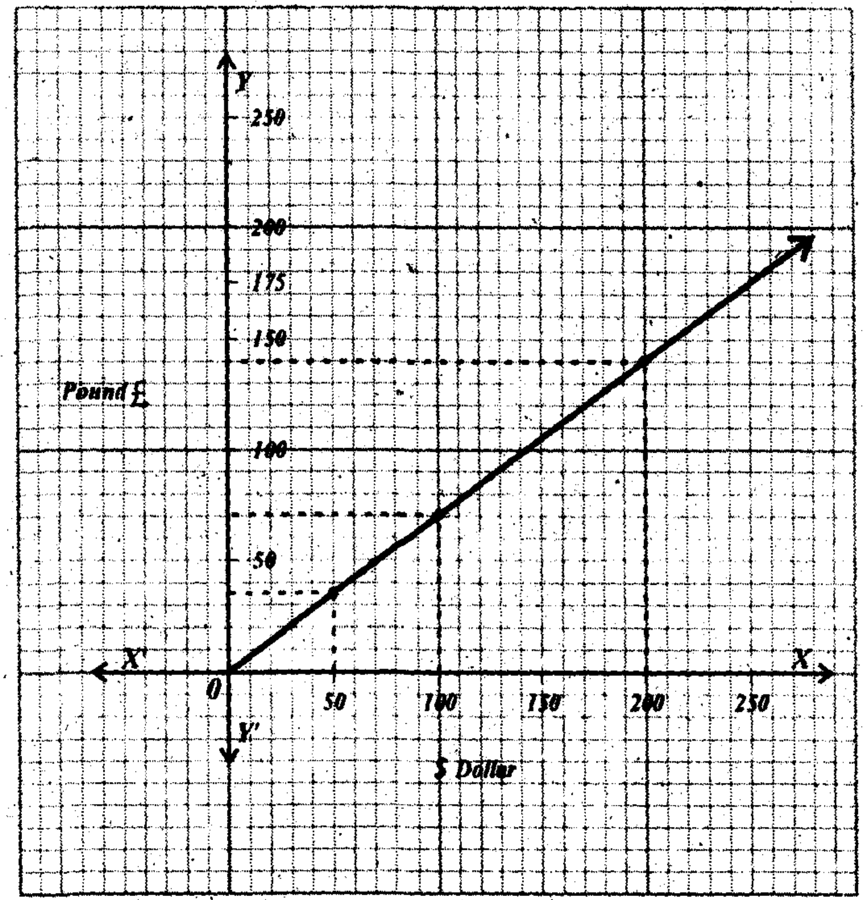
Use your graph to convert the following:

a) 160 dollars into £ b) 96 dollars into £

c) 120 £ into dollars d) 76 £ into dollars

Solution:

According to the given scale. Draw *x-axis* and *y-axis*, taking US Dollers along *x-axis* and Pounds along *y-axis*. From the given table the points *(50,35)*, *(100,70)*, *(200,140)* are taken and Located the line.



By this line Dollars and Pounds can be inter convertible.

(a) Corresponding to *160* dollars we nate the point *(160,112)*. So it means.

160 Dollars = *112* Pounds.

Similarly, with the help of this graph.

We see that

(b) *96* Dollars = *67.2* Pounds.

(c) *120* Pounds = *171.4* Dollars.

(d) *76* Pounds = *108.6* Dollars.

Q.3- The table below gives various distances in kilometers with the equivalent values in miles.

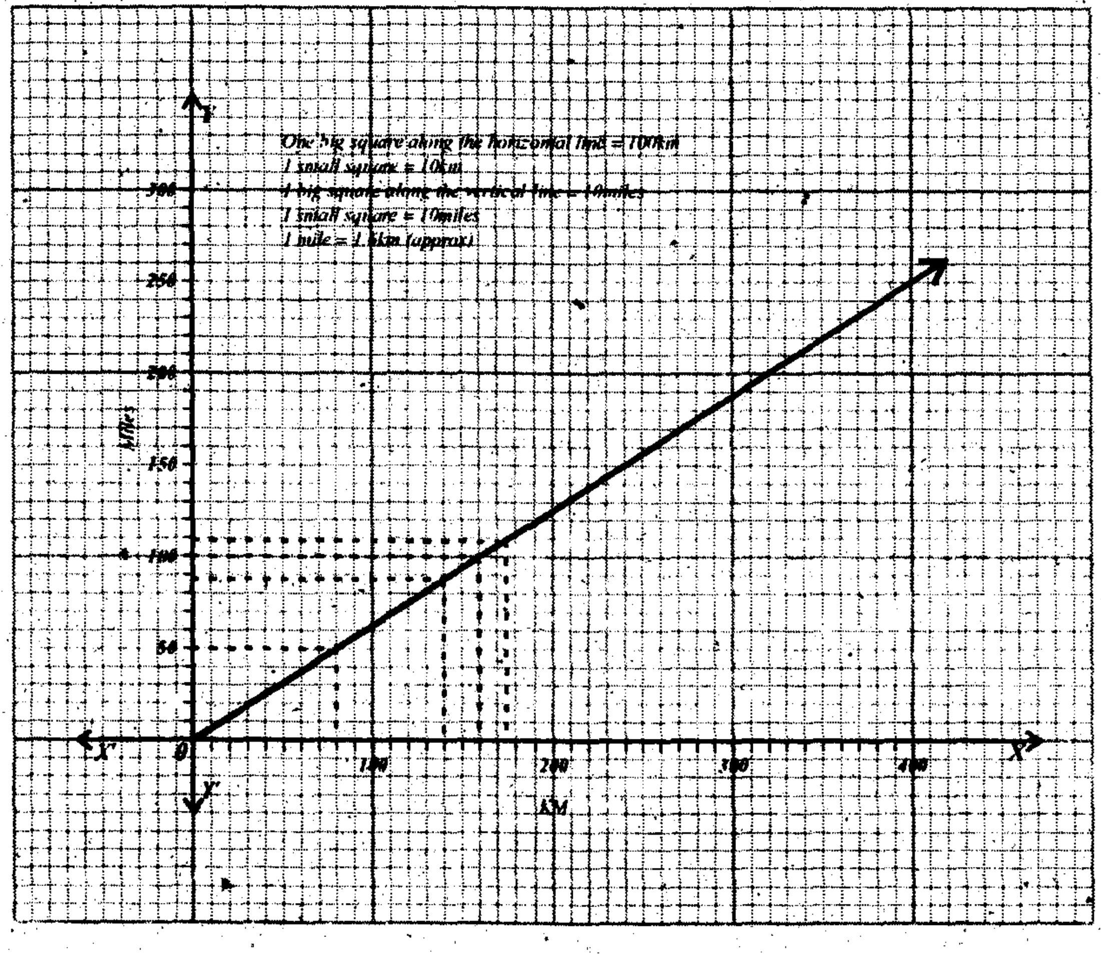
Kilometers	0	100	200	300
Miles	0	62.5	125	187.5

Plot these values on a graph paper taking 10 small squares equal to 100 kilometers on x-axis and 10 small squares equal to 100 miles on y-axis. Use your graph to convert the following:

a) 140 kilometers into miles b) 175 kilometers into miles

c) 50 miles into kilometers d) 100 miles into kilometers

Solution: According to the given scale and table. The points and line are drown on graph paper as given below



This conversion line shows that

(a) *140* km = *87.5* Miles.

(b) *175* km = *109.40* Miles.

(c) *50* Miles = *80* km.

(d) *100* Miles = *160* km.

Q.4- Use the graph in article 9.2.3 to convert:

(a) 6 acres into hectares.

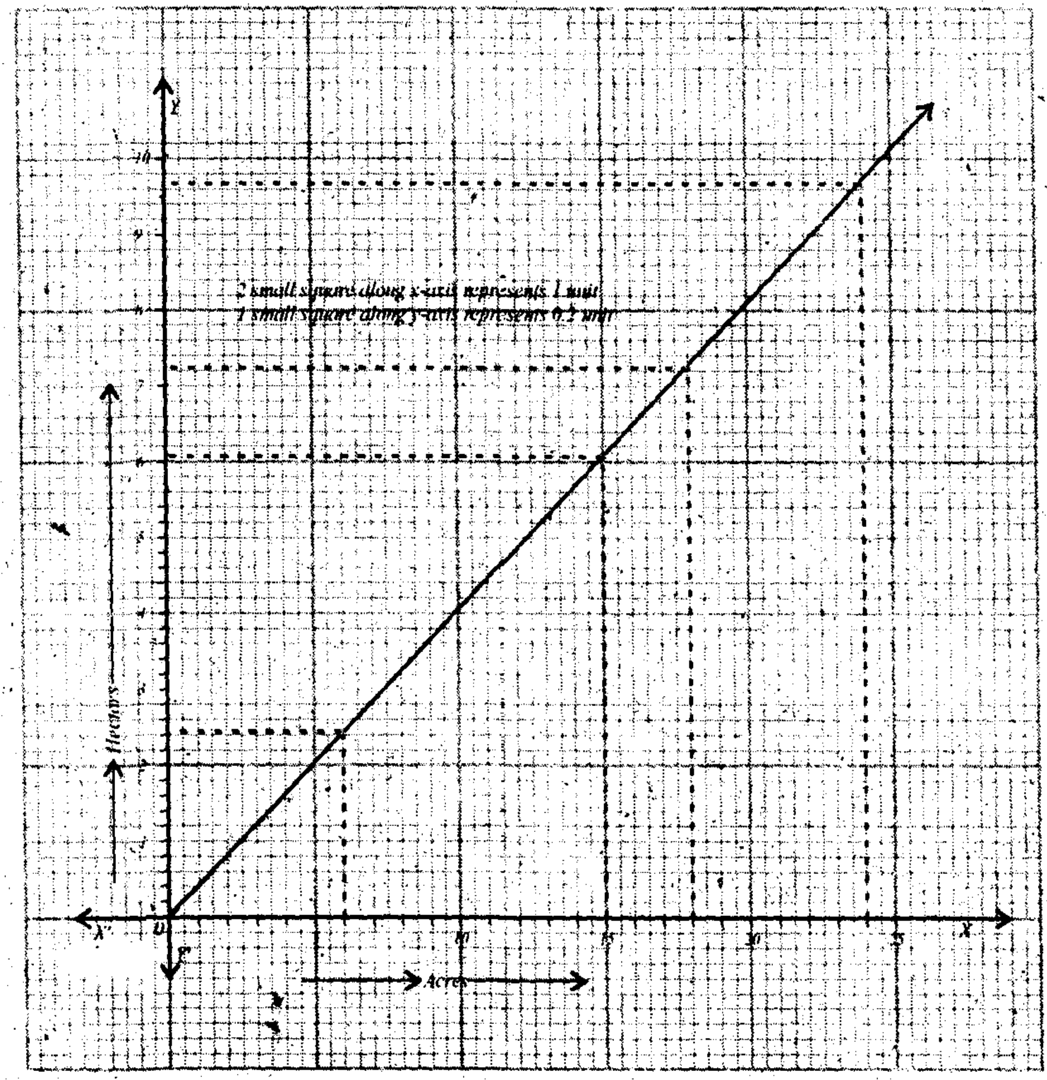
(b) 18 acres into hectares.

(c) 24 acres into hectares.

(d) 6.0702 hectares into acres.

Solution:

The graph refered in the question is given below.



The graph shows that

(a) *6* acres = *2.4278* Hectars.
(b) *18* acres = *7.2833* Hectars.
(c) *24* acres = *9.7111* Hectars.
(d) *6.0702* Hectars = *15.00* acres.

Review Exercise 9

Q.1- Encircle the correct answer.

(i) The co-ordinates of origin are:
(a) (1,0) *(b) (0,1)* *(c) (0,0)* *(d) (1,1)*

(ii) The perpendicular distance of a point form y-axis is called
(a) ordinate *(b)* abscissa *(c)* origin *(d)* straight line

(iii) The perpendicular distance of point from x-axis is called
(a) ordinate *(b)* abscissa *(c)* origin *(d)* straight line

(iv) For $x=1$ in $2x+y=6$, we have $y=?$
(a) 8 *(b)* 4 *(c)* -8 *(d)* -4

(v) For $y=2$ in $2x-y=6$, we have $x=?$
(a) 4 *(b)* -4 *(c)* 2 *(d)* -2

(vi) Graphs of equations in the form $y=c$ have y co-ordinate:
(a) 1 *(b)* c *(c)* 0 *(d)* -1

(vii) Graphs of equations in the form $x=a$ have x co-ordinate:
(a) a *(b)* undefined *(c)* 1 *(d)* c

(viii) $f(x)=\frac{x}{2}, 4\le x\le 12,$ x is a multiple of "*2*".

The domain of $f(x)$ is:
(a) $\{4,6,8,10,12\}$ *(b)* $\{6,8,10\}$
(c) $\{4,6,8,10\}$ *(d)* $\{2,3,4,5,6\}$

(ix) $f(x)=\frac{x}{2}, 4\le x\le 12,$ x is a multiple of "*2*".

The range of $f(x)$ is:
(a) $\{4,6,8,10,12\}$ *(b)* $\{2,3,4,5,6\}$
(c) $\{3,4,5\}$ *(d)* $\{2,3,4,5,6\}$

(x) If $y = 3x$, then for $x = 2$, we have $y = ?$

(a) 0 *(b)* 6 *(c)* -3 *(d)* 2

Ans:

(i) c	*(ii) b*	*(iii) a*	*(iv) b*
(v) a	*(vi) b*	*(vii) a*	*(viii) a*
(ix) b	*(x) b*		

Q.2- Fill in the blanks.

(i) A plane consisting of two number lines OX and OY intersecting at right angle at "O" is called a ______

(ii) The perpendicular distance of a point from y-axis is called______

(iii) The perpendicular distance of a point from x-axis is called______

(iv) The pair of numbers $(2,3)$ is called an______

(v) The horizontal line $X'OX$ is called______

(vi) The vertical line YOY' is called______

(vii) For a point $(-1,-2)$ we move 1 unit towards left of "O" and 2 units______

(viii) The co-ordinate of origin are______

(ix) An equation for a straight line that consists of y term is as______

(x) In the graph of $2x + y = 6$, the x-intercept is ______

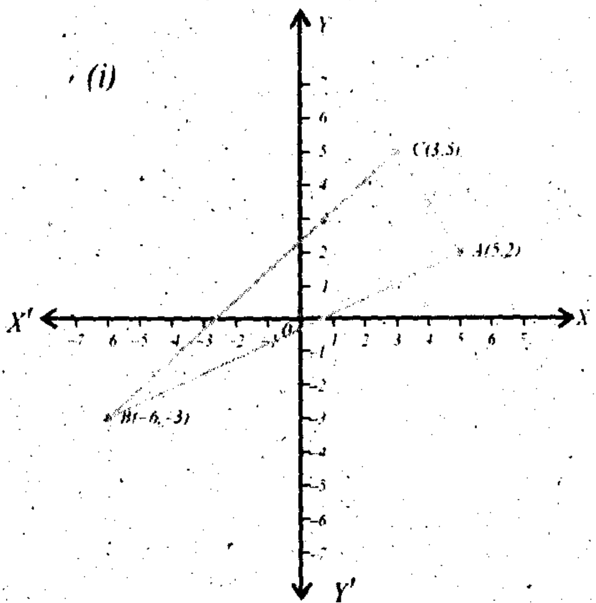
Ans:

(i) Co-ordinate plane	*(ii) Abscissa*	*(iii) Ordinate*	*(iv) Ordered pair*
(v) x-axis	*(vi) y-axis*	*(vii) Downward of x-axis*	*(viii) (0,0)*
(ix) $y = c$	*(x) 3*		

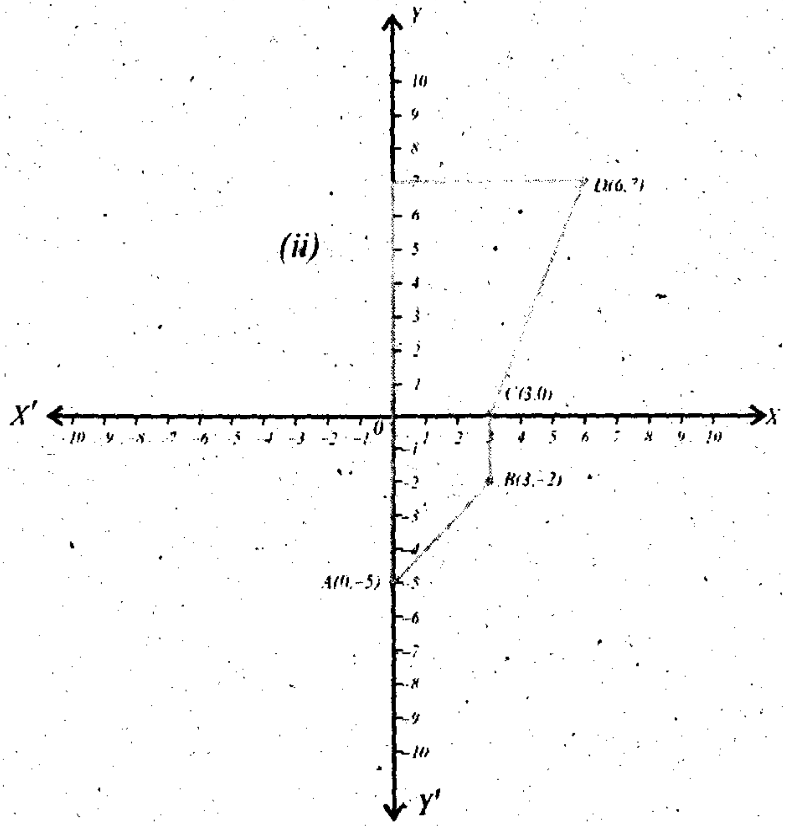
Q.3- Draw the figures with the help of the following points on the graph paper.

Solution:

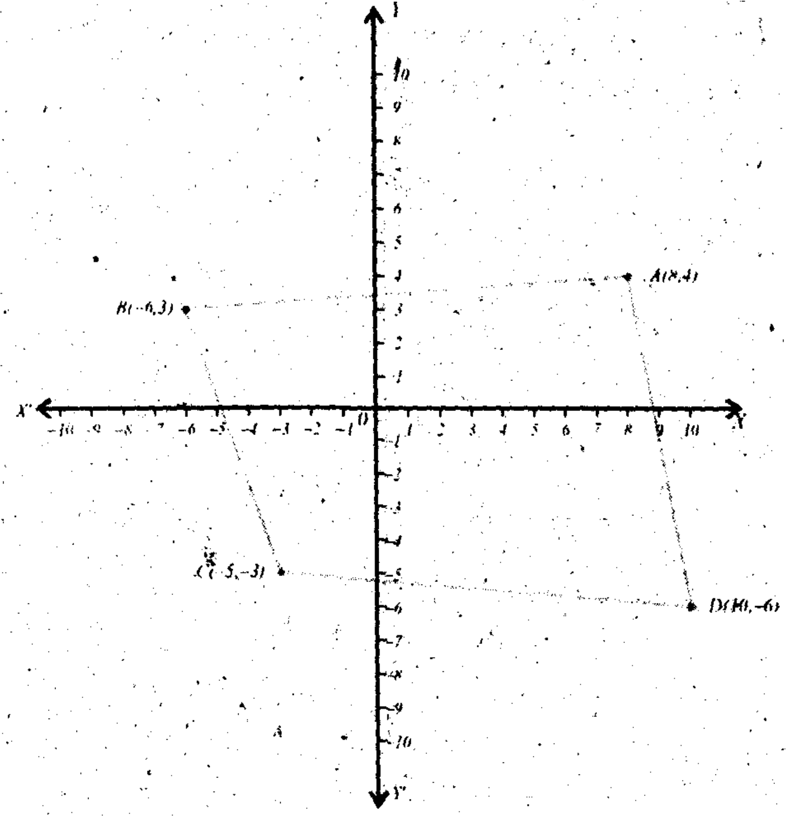
(i) A(5,2), B(-6,-3) and C(3,5)



(ii) A(0,-5), B(3,-2), C(3,0) and D(6,7)



(iii) A(8,4), B(-6,3), C(-5,-3) and D(10,-6).


Y
X'
X
Y'
0
A(8,4)
B(-6,3)
C(-5,-3)
D(10,-6)
-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10
10 9 8 7 6 5 4 3 2 1 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10

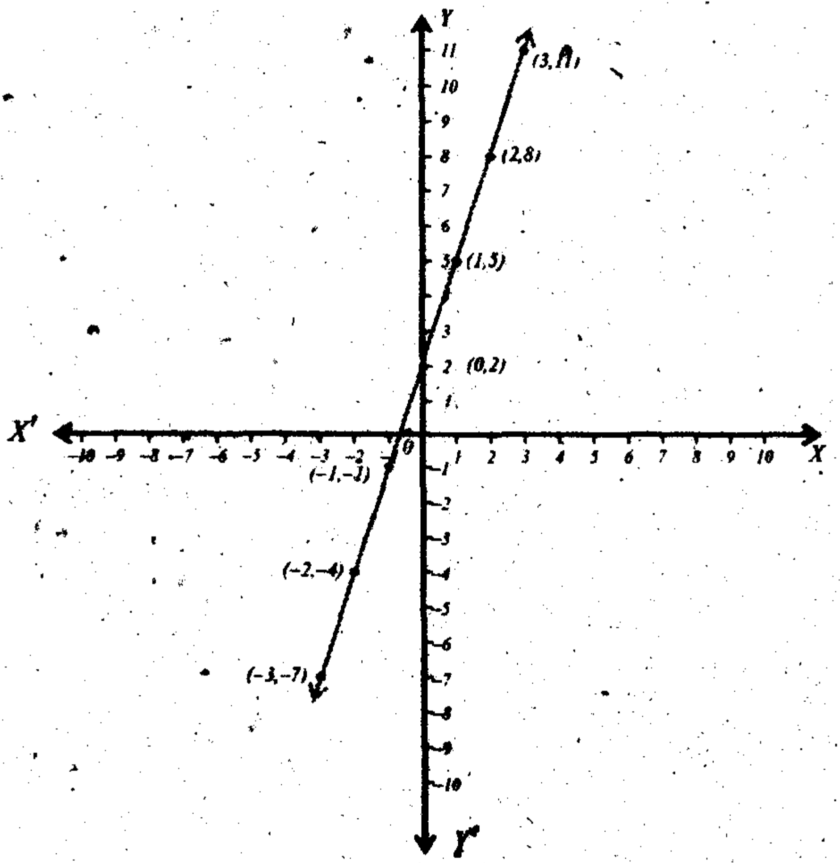
Q.4- Sketch the graph

(i) Sketch the graph of $y=3x+2$

Solution: Put different values of x in the equation.

For $x=-3, y=-7 \Rightarrow (-3,-7)$ is on the graph.
For $x=-2, y=-4 \Rightarrow (-2,-4)$ is on the graph.
For $x=-1, y=-1 \Rightarrow (-1,-1)$ is on the graph.
For $x=0, y=2 \Rightarrow (0,2)$ is on the graph.

Now we plot these points on graph paper and join them as given below.



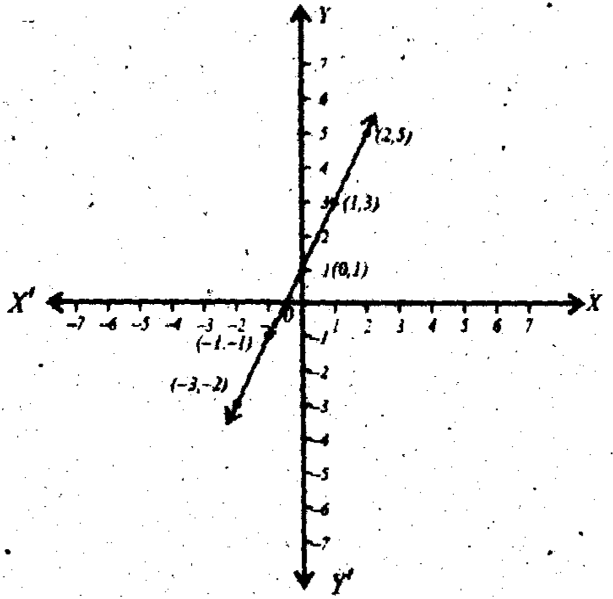
(ii) Sketch the graph of $y=2x+1$

Solution:

Replace x by different numbers.

For $x=-3, y=-5 \Rightarrow (-3,-5)$ is on the graph.
For $x=-2, y=-3 \Rightarrow (-2,-3)$ is on the graph.
For $x=-1, y=-1 \Rightarrow (-1,-1)$ is on the graph.
For $x=0, y=1 \Rightarrow (0,1)$ is on the graph.
For $x=2, y=3 \Rightarrow (2,3)$ is on the graph.

Now plot these points on graph paper and join them.



(iii) Sketch the graph of $y = x + 1$

Solution:

Here

For $x = -2, y = -1 \Rightarrow (-2, -1)$ is on the graph.

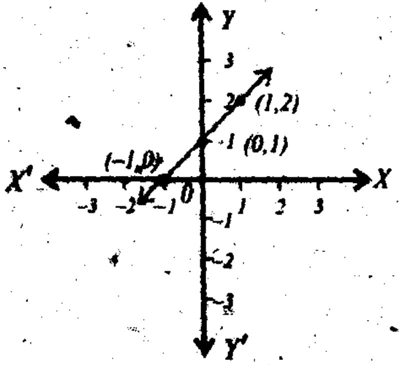
For $x = -1, y = 0 \Rightarrow (-1, 0)$ is on the graph.

For $x = 0, y = 1 \Rightarrow (0, 1)$ is on the graph.

For $x = 1, y = 2 \Rightarrow (1, 2)$ is on the graph.

For $x = 2, y = 3 \Rightarrow (2, 3)$ is on the graph.

Locate these points on graph paper and join them as given below.



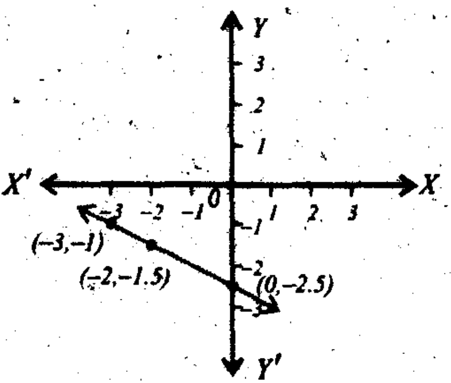
(iv) Sketch the graph of $y = -\frac{x}{2} - \frac{5}{2}$

Solution: Replace x for different numbers.

For $x = -3, y = -1 \Rightarrow (-3, -1)$ is on the graph.

For $x=-1, y=-2 \Rightarrow (-1,-2)$ is on the graph.
For $x=1, y=-3 \Rightarrow (1,-3)$ is on the graph.
For $x=3, y=-4 \Rightarrow (3,-4)$ is on the graph.

Locate these points on graph paper and join them as given below.



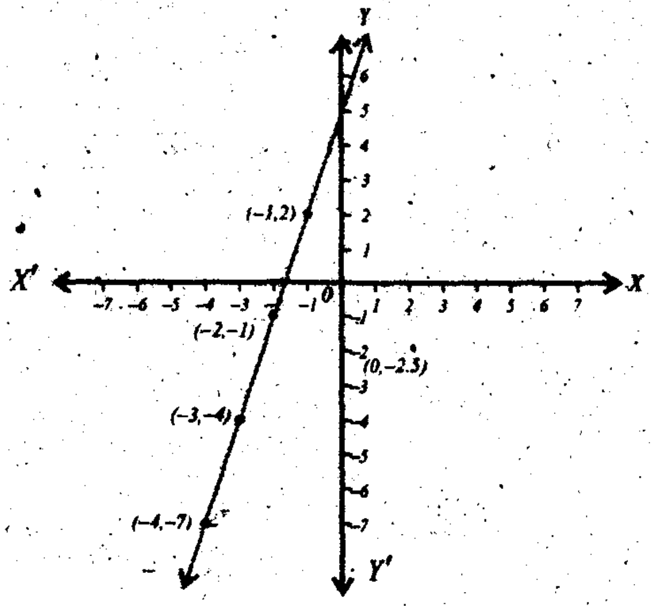
(v) Sketch the graph of $y = 3x + 4$

Solution:

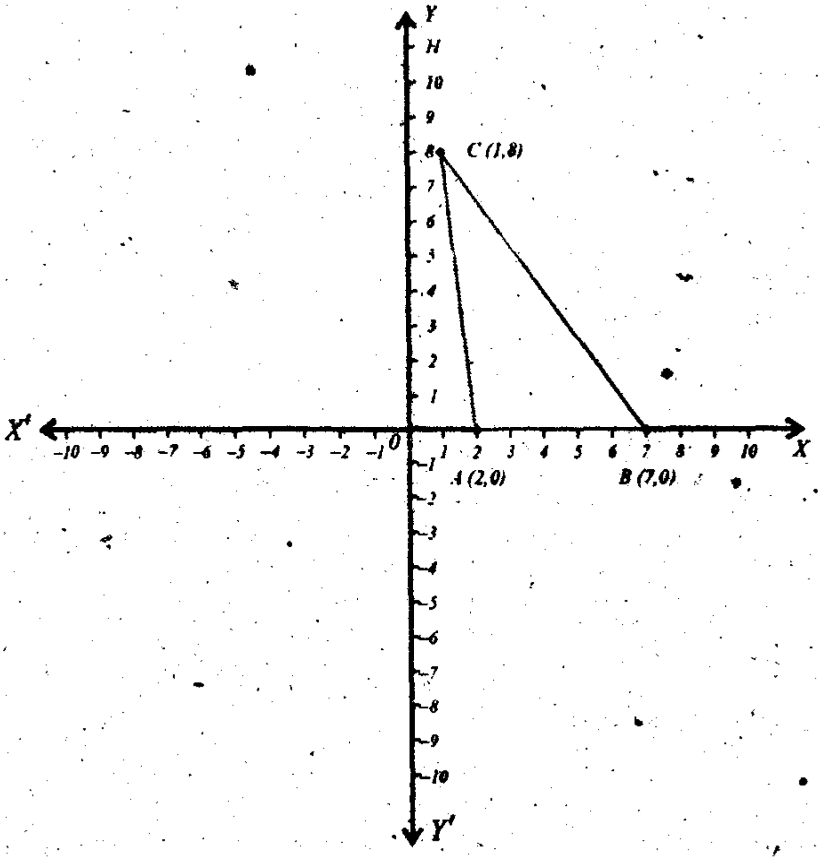
Replace x for different numbers.

For $x=-2, y=-2 \Rightarrow (-2,-2)$ is on the graph.
For $x=-1, y=1 \Rightarrow (-1,1)$ is on the graph.
For $x=0, y=4 \Rightarrow (0,4)$ is on the graph.
For $x=1, y=7 \Rightarrow (1,7)$ is on the graph.
For $x=2, y=10 \Rightarrow (2,10)$ is on the graph.

Locate these points on graph paper and join them as given below.



Q.5- **Draw the graph by plotting points A(2,0), B(7,0) and C(1,8).**



Q.6- **If $f(x)=\frac{x}{2}$, $4 \le x \le 12$ and x is an integer multiple of 2. Then find the domain and range of f(x).**

Ans. As $4 \le x \le 12$ and x is an integer multiple of 2. So values of x in the funtion. We get

$$f(x)=\frac{x}{2} \Rightarrow f(4)=\frac{4}{2}=2$$

For $x=6 \Rightarrow f(6)=\frac{6}{2}=3$

For $x=6 \Rightarrow f(8)=\frac{8}{2}=4$

For $x=10 \Rightarrow f(10)=\frac{10}{2}=5$

For $x=12 \Rightarrow f(12)=\frac{12}{2}=6$

Thus $f(x)=\{(4,2),(6,3),(8,4),(10,5),(12,6)\}$

So Dom: $f(x)=\{4,6,8,10,12\}$

Rng: $f(x)=\{2,3,4,5,6\}$

MULTIPLE CHOICE QUESTIONS

Q.1- Tick the best of given choice.

(i) Choose the wrong statement.

(a) $\{x, y\} = \{y, x\}$ (b) $(x, y) = (y, x)$
(c) $(9, 1) = (9, 1)$ (d) $(p, q) = (p, q)$

Q.2- The point $(-3, 0)$ is

(a) On *x-axis* (b) On *y-axis*
(c) Above *x-axis* (d) Blow *x-axis*

Q.3- Graph of a Linear equation is

(a) Alwayes line (b) Never line
(c) Some times lime
(d) Some times other than line.

Q.4- The graph of equation $y = 3x + 1$ passes through.

(a) $(0,0)$ (b) $(2,5)$
(c) $(3,10)$ (d) $(0,2)$

Q.5- The line $y = 5$ is

(a) Parallel to *x-axis* (b) Parallel to *y-axis*
(c) Cuts *x-axis* (d) Not cuts *y-axis*

Q.6- The line $x = -2$ is

(a) Above *x-axis* (b) Below *x-axis*
(c) On left of *y-axis* (d) On right of *y-axis*

Q.7- The line $y = 2x + 6$ Cuts x-axis at

(a) $x = 3$ (b) $x = -3$
(c) $y = 6$ (d) $y = 8$

Q.8- The first element of ordered pair (x, y) is called

(a) Ordinate (b) Abscissa
(c) Domain (d) Range

Q.9- The equation of a line parallel to x-axis and below x-axis is

(a) $y = 5$ (b) $y = -3$
(c) $x = -5$ (d) $x = 3$

Q.10- **The equation of a line parallel to y-axis and on right side of y-axis is**

(a) $x = 3$ (b) $x = -3$

(c) $y = 3$ (d) $y = -3$

MODEL CLASS TEST

Time : One Hour Max Marks : 25

Q.1- Tick the best of given choices.

(i) The point $(-3, 1)$ is

(a) On *x-axis* (b) On *y-axis*

(c) Above *x-axis* (d) below *x-axis*

(ii) The point $(1, -4)$ is on the line

(a) $y = x + 1$ (b) $y = 2x + 2$

(c) $y = 2x - 6$ (d) $y = 2x + 6$

(iii) The line $y = 3x$, press through the

(a) Origine (b) $(0, 1)$

(c) $(3, 0)$ (d) $(3, 3)$

(iv) In the function $y = 3x + 2$, the set of values of x is called

(a) Range (b) Domain

(c) Ordinate (d) Abscissa

(v) $0^{o}C$ is equal to

(a) ^{0}F (b) $10^{0}F$

(c) $25^{0}F$ (d) $32^{0}F$

(vi) *200* Kilometers are equal to

(a) *100* Miles (b) *125* Miles

(c) *150* Miles (d) *200* Miles

(vii) Two units of the same quantity can be inter converted easily by.

(a) Linear graph (b) Non linear graph

(c) Conversion graph (d) Point graph.

Q.2- Attempt any five questions.

(i) Plot the points and join them orderly.
$A(0,-7), B(3,-2), C(4,0)$

(ii) Find four points lying on the line $y = 2x + 3$.

(iii) Draw the graph of $y = 5$

(iv) Draw the graph of $x = -2$

(v) Draw the graph of $y = x$

(vi) Define domain and range of a funtion.

(vii) If $f(x) = \frac{x}{2}$, $4 \le x \le 12$ and x is an integer, multiple of 2, then find domain and range of $f(x)$.

Attemp anw two of the following questions.

Q.3- Draw the graph of $y = -\frac{x}{2} - \frac{5}{2}$

Q.4- Consider the table

Kilometers	**0**	**100**	**200**	**300**
Miles	**0**	**62.5**	**125**	**187.5**

Plot the graph and using this graph, convert

(a) 140 km into miles (b) 50 Miles into Km.

Q.5- Draw the graph of $y = 4x - 1$

◆

UNIT 10 BASIC STATISTICS

SHORT QUESTIONS

Q.1- Define frequency of a value in a data.

Ans. If a values "x" Occurs "n" times in a data then n is called frequency of x.

If there are "f" number of values between x_1 to x_2 then "f" is called frequency of interval $x_1 - x_2$.

Q.2- Define "Histogram".

Ans. When a bar chat for a given data is constructed so that the area of each bar is propositional to the frequency of corresponding group. This chart is called histogram.

Q.3- How is a frequency polygon constructed?

Ans. It is a many sided closed figure. It is constructed by plotting frequencies against the class marks and then joining the points by straight lines.

A frequency polygon can also be obtained by joining the mid points of the tops of all the rectangles in the histogram.

Q.4- Define the term "Ogive".

Ans. When the cumulative frequencies are plotted against the end points of their respective class intervals and joining the points together, the resulting graph is called cumulative frequency Polygon or Ogive.

Q.5- Define "Arithematic Mean" of n values of ungrouped data.

Ans. The Arithmetic mean of n values $x_1, x_2, x_3 \dots x_n$ is defined as:

$$\text{A.M} = \bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

Q.6- Define "Medain" of n valued ungrouped data.

Ans. The medain of an ungrouped data is the middle value of the set of values in the data when the data is arranged in numerical order.

To find the medain of a given data, following steps are taken.

1- Arrange the data in numerical order.

2- In case of odd number of terms the middle term is median.

3- In case, these are even number of terms the average of the two middle terms is taken a median.

Q.7- Define "Mode of a data".

Ans. The mode is the "value" which occurs greatest times in the set of data. For example consider the data *3,2,4,5,4,6,4,8.*

In this data *4* occurs thrice. So *4* is the mode.

Q.8- Define "Geometric Mean".

Ans. The geometric mean "G" of n positive values $x_1, x_2, x_3 \dots x_n$ is the nth root of the product of the values. Thus.

$$G = \sqrt[n]{x_1 . x_2 . x_3 \dots x_n}$$

$$= (x_1 \times x_2 \times x_3 \times \dots \times x_n)^{\frac{1}{n}}$$

For example.

G.M of *2,4,8* is

G.M $= \sqrt[3]{2\times 4\times 8} = 64^{\frac{1}{3}}$

G.M $= 4$

Q.9- Define "Range" of a data.

Ans. Range is the simplest measure of dispersion. Range of a data is the difference between the largest and the smallest value in the data.

So,

Range = (largest value) − (smallest value)

$$R = x_m - x_a$$

Q.10- Consider the data 6,2,5,3,4,5,4,5,1. Find the mean, Median and Mode.

Solution.

The arranged data is

$1,2,3,4,4,5,5,5,6$

There are nine term and the middle term is 4. Thus

Median $= 4$.

5 occurs the greatest number of times

So Mode $= 5$

$$\text{Mean} = \frac{1+2+3+4+4+5+5+5+6}{9}$$

$$= \frac{35}{9} = 3.89$$

SOLVED EXERCISES

EXERCISE 10.1

Q.1- **Fifty Junior school children joined the school's computer club. Their ages were recorded.**

10	**8**	**9**	**10**	**7**	**8**	**8**	**11**	**10**	**9**
7	**8**	**9**	**9**	**10**	**11**	**11**	**10**	**9**	**8**
8	**7**	**9**	**7**	**10**	**7**	**10**	**8**	**9**	**11**
10	**11**	**8**	**10**	**9**	**8**	**9**	**7**	**11**	**10**
9	**10**	**10**	**11**	**10**	**11**	**7**	**11**	**10**	**9**

Make a frequency table showing the number of each age and illustrate this information with a bar chart.

Solution. Frequency Table

Age	Tally marks	Frequency
7	𝍸 ||	*7*
8	𝍸 ||||	*9*
9	𝍸 𝍸 |	*11*
10	𝍸 𝍸 ||||	*14*
11	𝍸 ||||	*9*

Q.2- **The local fish and chip shop had 56 customers on Saturday evening. They spent the following amount in rupees.**

270	**110**	**45**	**96**	**250**	**490**	**325**	**45**
382	**136**	**125**	**450**	**420**	**380**	**150**	**250**
85	**250**	**320**	**525**	**218**	**210**	**216**	**120**
155	**430**	**250**	**40**	**510**	**150**	**510**	**245**
320	**120**	**316**	**150**	**260**	**45**	**180**	**310**
273	**280**	**85**	**280**	**318**	**45**	**210**	**282**
462	**316**	**218**	**316**	**325**	**45**	**560**	**315**

use groups Rs.0-99, Rs.100-199, Rs.200-299, Rs.300-399, Rs.400-499, Rs.500-599 to make a frequency table illustrate the data with a bar chart.

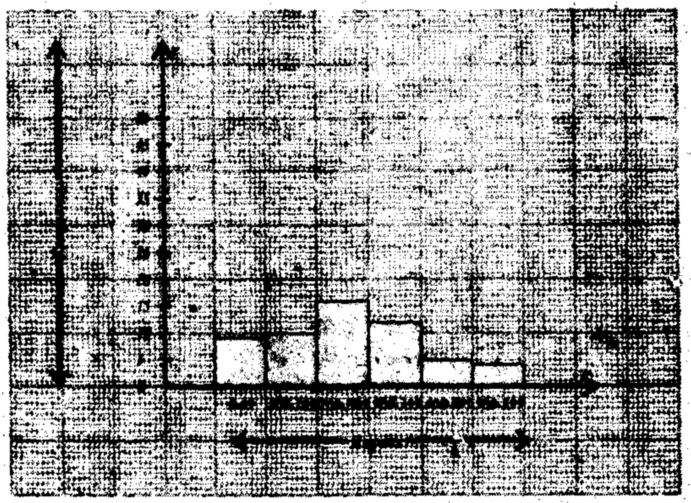
Solution.

Frequency Table

Class intervals	Tally Marks	Frequency
Rs 0---99	𝍸 ||||	9
Rs 100---199	𝍸 𝍸	10
Rs 200---299	𝍸 𝍸 𝍸 |	16
Rs 300---399	𝍸 𝍸 ||	12
Rs 400---499	𝍸	5
Rs 500---599	||||	4

For bar chart

Class intervals	Class Boundaries	Frequency
0---99	*0---99.5*	*9*
100---199	*99.5---199.5*	*10*
200---299	*199.5---299.5*	*16*
300---399	*299.5---399.5*	*12*
400---499	*399.5---499.5*	*5*
500---599	*499.5---599.5*	*4*



Q.3- **The weights to the nearest gram of 30 bags of popcorn sold at a festival are given as:**

69	83	75	65	68	68	73	70	80	79
70	76	63	86	69	65	66	74	86	68
70	60	67	74	65	65	67	88	81	63

Make a frequency table, Illustrate the data with a bar chart.

Solution.

Frequency Table

Class Interval	Class Boundaries	Tally Marks	Frequency
60---64	*59.5---64.5*	|||	*3*
65---69	*64.5---69.5*	卌 卌 ||	*12*
70---74	*69.5---74.5*	卌 |	*6*
75---79	*74.5---79.5*	|||	*3*
80---84	*79.5---84.5*	|||	*3*
85---89	*84.5---89.5*	|||	*3*

Make Bar-Chart

EXERCISE 10.2

Q.1- **Draw a histogram to represent the frequency table in each of the following tables.**

(i) The table shows the distribution of ages of 100 people attending a school function.

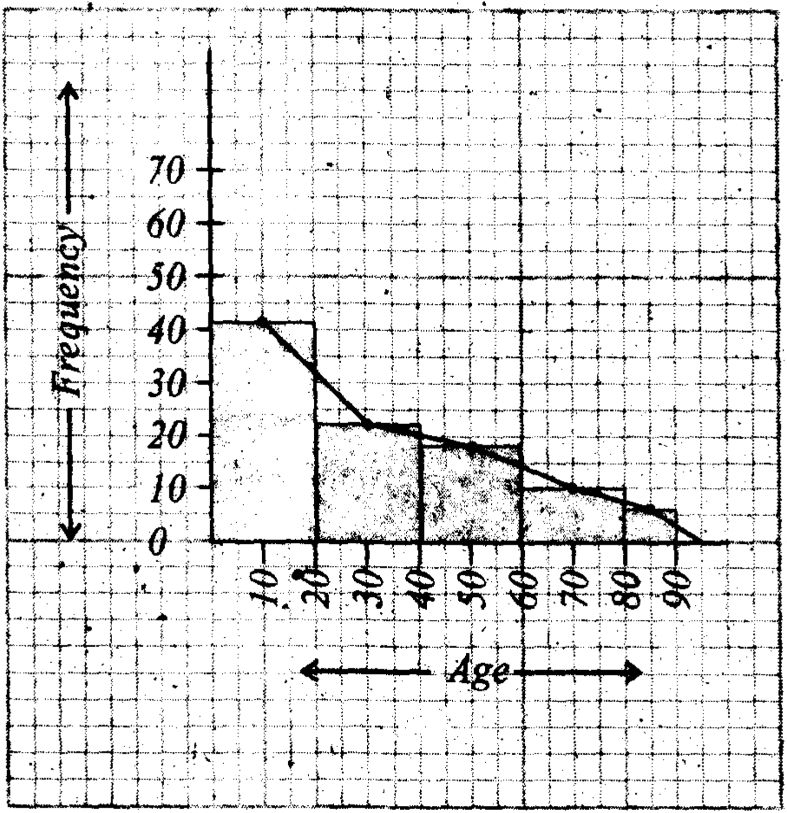
Age (Years)	**0-19**	**20-39**	**40-59**	**60-79**	**80-89**
Frequency	**43**	**24**	**17**	**10**	**6**

Solution.

The given table with class boundaries is

Age(Year)	Class boundaries	Frequency
0---19	*0---20*	*43*
20---39	*20---40*	*24*

40---59	40---60	17
60---79	60---80	10
80---89	80---90	6



(ii) The table shows the results of a survey on the weekly earnings of *100* sixteen-year old boys.

Weekly earnings	0-9	10-19	20-29	30-39	40-49	50-59
Frequency	45	10	11	21	10	3

Solution. The given table with class boundaries is

Class intervals	Class boundaries	Frequency
0-9	0-10	45
10-19	10-20	10
20-29	20-30	11
30-39	30-40	21
40-49	40-50	10
50-59	50-60	03

Make Histogram

(iii) The table shows the distribution of the average marks of *40* children in the end-of-year examinations.

Average	*1-20*	*21-40*	*41-60*	*61-80*	*81-100*
Frequency	*2*	*4*	*19*	*12*	*3*

Ans. The given table with class boundaries is

Class intervals	Class boundaries	Frequency
1-20	*0.5-20.5*	*2*
21-40	*20.5-40.5*	*4*
41-60	*40.5-60.5*	*19*
61-80	*60.5-80.5*	*12*
81-100	*80.5-100.5*	*3*

Make Histogram

Q.2- Following histogram shows the distribution of the times taken by 50 children to go to school. Construct a frequency table from the histogram.

Solution. Frequency table

Class Intervals	Frequency
1---10	*5*
11---20	*15*
21---30	*13*
31---40	*5*
41---60	*5*

Q.3- Following histogram is based on the number of hours that 30 children spent watching television on a particular Saturday. Construct a frequency table from the histogram.

Ans. Frequency Table

0-1	*1-2*	*2-3*	*3-4*	*4-5*
2	*12*	*8*	*6*	*3*

EXERCISE 10.3

Q.1- Represent the given data using Frequency polygon.

(i) The table shows the distribution of marks of 30 children in a test.

Marks	0-39	40-49	60-79	80-99
Frequency	8	8	10	4

Solution. The given table is

Marks	Mid-points	Frequency
0-39	19.5	8
40-49	44.5	8
50-59	54.5	0
60-79	69.5	10
80-99	89.5	4

Histogram and Frequency Polygon

(ii) The table shows the distribution of length (to the nearest 10mm) of 50 blades of grass.

Time (second)	1-40	41-50	51-60	61-70
Frequency	8	15	7	10

Solution.

Time	Class boundary	Frequency
1-40	0.5-40.5	8
41-50	40.5-50.5	15
51-60	505-60.5	7
61-70	60.5-70.5	10

(iii) The table shows the distribution of weights of 30 bags of chips from a fish and chip shop.

Weight(grams)	1-50	51-60	61-70	71-80
Frequency	4	8	14	4

Solution.

Weight	Class boundaries	Frequency
1-50	*0.5-50.5*	*4*
51-60	*50.5-60.5*	*8*
61-70	*60.5-70.5*	*14*
71-80	*70.5-80.50*	*4*

(iv) The table gives the distribution of marks of *100* students in an end of-terms mathematics examination.

Marks	*0-29*	*30-39*	*40-49*	*50-59*	*60-69*
Frequency	*10*	*15*	*25*	*34*	*16*

Ans.

Marks	Class boundaries	Frequency
0-29	*0-30*	*10*
30-39	*30-40*	*15*
40-49	*40-50*	*25*
50-59	*50-60*	*34*
60-99	*60-100*	*16*

EXERCISE 10.4

Q.1- Construct a cumulative frequency polygon (that is, an ogive) for the given data.

(i) The table shows the distribution of weights (in kilograms) of 60 boys of ten years of age.

Weight (kg)	*31-36*	*37-39*	*40-42*	*43-45*	*46-54*
Frequency	*8*	*10*	*18*	*12*	*12*

Solution.

Class Intervals	Class boundaries	*f*	*c.f*
31-36	*30.5-36.5*	*8*	*8*
37-39	*36.5-39.5*	*10*	*18*

40-42	39.5-42.5	18	36
43-45	42.5-45.5	12	48
46-54	45,5-54.5	12	60

Make Ogive

(ii) The table shows the distribution of times taken (in minutes) for 50 children of five years age to eat their school dinners.

Time(minutes)	4-5	6-7	8-9	10-11	12-15	16-19	20-29
Frequency	5	4	10	9	6	6	10

Ans.

Class Intervals	Class boundaries	f	$c.f$
4-5	3.5-5.5	5	5
6-7	5.5-7.5	4	9
8-9	7.5-9.5	10	19
10-11	9.5-11.5	9	28
12-15	11.5-15.5	6	34
16-19	15.5-19.5	6	40
20-29	19.5-29.5	10	50

Make Ogive

Solution.

Class Intervals	Class boundaries	f	$c.f$
0-9	0-10	10	10
10-19	10-20	20	30
20-29	20-30	30	60
30-39	30-40	20	80
40-69	40-70	15	95

Make Ogive

(iv)

Classes	5-10	10-15	15-20	20-25	25-30
Frequency	10	15	20	30	15

Solution.

Class boundaries	f	$c.f$
5-10	10	10
10-15	15	25
15-20	20	45
20-25	30	75
25-30	15	90

Make Ogive

(v) The table gives the distribution of weights (kilograms) of *100* people.

Weight(kilogram)	50-59	60-69	70-79	80-89	90-99	100-109
Frequency	15	30	35	15	3	2

Solution.

Class Intervals	Class Boundaries	f	$c.f$
50-59	49.5-59.5	15	15
60-69	59.5-69.5	30	45
70-79	69.5-79.5	35	80
80-89	79.5-89.5	15	95
90-99	89.5-99.5	3	98
100-109	99.5-109.5	2	100

Make Ogive

Review Exercise 10

Q.1- Encircle the correct answer.

(i) When a bar graph is constructed, so that the area of each bar is proportional to the number of items in each group is called.

(a) curve *(b)* ogive
(c) histogram *(d)* bar diagram

(ii) The summary statistics which measure the middle (or center) of the data is called:

(a) mean *(b)* mode
(c) median *(d)* all of these

(iii) If all numbers in a set are added together and then the total is divided by the number of scores in the set is called

(a) mean *(b)* mode
(c) median *(d)* weighted mean

(iv) The middle values of the data arranged in numerical order is called

(a) mode *(b)* median
(c) mean *(d)* geometric mean

(v) The score which occurs most often in a set of data is called

(a) mode *(b)* mean
(c) median *(d)* geometric mean

(vi) $\bar{X} = \dfrac{x_1 + x_2 + x_3 + \ldots + x_n}{n}$

(a) means value of $x_1, x_2, \ldots, x_n$ *(b)* arithmetic mean
(c) geometric mean *(d)* weighted mean

(vii) $H = \dfrac{n}{\sum\left(\dfrac{1}{x}\right)}$ is called.

(a) harmonic mean (b) mode
(c) mean (d) arithmetic mean

(viii) $\overline{X}_w = \dfrac{\sum wx}{\sum w}$

(a) arithmetic mean (b) weighted mean
(c) geometric mean (d) mean

(ix) $\sum(x_i - \overline{X}) = 0$ is one of the properties of

(a) arithmetic mean (b) geometric mean
(c) harmonic mean (d) mode

Ans:

(i) c	(ii) d	(iii) a	(iv) b
(v) a	(vi) b	(vii) a	(viii) b
(ix) a			

Q.2- Fill in the blanks.

(i) When a bar graph is constructed, so that the area of each bar is proportion to the number of items in each group is called a_____

(ii) The summary statistic which measure the middle (or center) for the data is called_____

(iii) If all numbers in a set are added together and then the total is divided by the number of scores in the set is called_____

(iv) The middle value of data arranged in numerical order is called_____

(v) The score which occurs most often in a set of data is called_____

(vi) $\overline{X}=\dfrac{x_1+x_2+x_3+\cdots+x_n}{n}$ is called the_____

(vii) The nth root of the product of the values of *a* set of *n* positive values is called_____

(viii) $H=\dfrac{n}{\sum\left(\dfrac{1}{x}\right)}$ is called the_____

(ix) $\overline{X}_w=\dfrac{\sum wx}{\sum w}$ is called the_____

(x) $\sum(x_i-\overline{X})=0$ is one of the properties of_____

Ans:

(i) Histogram	*(ii) Mean Median or made*	*(iii) Arithmetic mean*	*(iv) Median*
(v) Mode	*(vi) Arithmetic Mean*	*(vii) Geometric Mean*	*(viii) Harmonic Mean*
(ix) Weighted Mean	*(x) Arithmetic Mean*		

Q.3- Find the standard deviation of the values 2, 3, 6, 8, 11.

Solution:

$$\overline{x}=\frac{2+3+6+8+11}{5}=\frac{30}{5}=6$$

Now

$$S.D=\sqrt{\frac{\sum(x-\overline{x})^2}{n}}$$

$$= \sqrt{\frac{(2-6)^2+(3-6)^2+(6-6)^2+(8-6)^2+(11-6)^2}{5}}$$

$$\text{S.D} = \sqrt{\frac{16+9+0+4+25}{5}} = \sqrt{\frac{54}{5}}$$

$$= \sqrt{10.8} = 3.29 \text{ Ans.}$$

Q.4- **Find the standard deviation and variation for a set of ungrouped values, when** $n = 15,\ \sum x = 48, \bar{x} = 10$.

Ans. Solution:

Q.5- **For the data 3, 5, 6, 8, 8, 9, 10 , find**

(i) Mean *(ii)* Median *(iii)* Mode

Solution:

$$\text{Mean} = \frac{\sum x}{n} = \frac{3+5+6+8+8+9+10}{7}$$

$$\text{Mean} = \frac{49}{7} = 7$$

To find the median the arranged data is

$$\underbrace{3,5,6,}\ 8,\ \underbrace{8,9,10}$$

The Middle term is 8. So

Median $= 8$

To find the mode, we see 8 is repeated two times in the data.

So Mode $= 8$

Q.6 **Find the mean, median and mode for the set of the value 4, 6, 7, 4, 8, 9, ,7, 10.**

Ans. Solution:

$$\bar{x} = \frac{\sum x}{n}$$

$$\text{Mean} = \bar{x} = \frac{4+6+7+4+8+9+7+10}{8}$$

$$=\frac{55}{8}=6.875$$

To find the median, the arranged data is

$$\underbrace{4,4,6},7,7,\underbrace{8,9,10}$$

There are eight terms, so median is the mean of the middle two terms 7 and 7. So

$$\text{Median} =\frac{7+7}{2}=\frac{14}{2}=7$$

To find mode, we see 4 and 7 both appears twice in the data. So 4 and 7 both are Modes of the given data.

MULTIPLE CHOICE QUESTIONS

Q.1- In histogram each bar represent the frequency by its

(a) Height (b) Length (c) Width (d) Area

Q.2- A frequency polygon can also be obtained by joining the ___ of the top of the rectangles in the histogram.

(a) Last points (b) Initial points

(c) Mid-points (d) End-points

Q.3- Cumulative frequency of the last class interval is equal to

(a) $\sum x$ (b) $\sum f$ (c) $\sum fx$ (d) $\frac{\sum x}{n}$

Q.4- Ogive is also called.

(a) Frequency Polygon

(b) Cumulative frequency Polygon

(c) Histogram (d) Bar chart.

Q.5- The middle term of an ordered data is

(a) Mean (b) Median

(c) Mode (d) Range

Q.6- **The most frequent observation in a data set is called.**

(a) Mean *(b)* Median

(c) Mode *(d)* Range

Q.7- **Arithmetic Mean is equal to**

(a) $\frac{\sum x}{n}$ *(b)* $\frac{\sum fx}{\sum f}$

(c) $A+\frac{\sum fd}{\sum f}$ *(d)* All of these

Q.8- **The $\frac{n+1}{2}$ th term of numerically Ordered data is called.**

(a) Mean *(b)* Median

(c) Mode *(d)* Range

Q.9- **Median of a data can be estimated from the graph of**

(a) Histogram *(b)* Frequency Polygon

(c) Ogive *(d)* Bar Chart

Q.10- **A given data can have more then one value of**

(a) Mean *(b)* Median

(c) Mode *(d)* Range

Q.11 **There may be a data that have no value of**

(a) Mean *(b)* Median

(c) Mode *(d)* S.D

Q.12- **Which of the four valued data has same values of Mean, Median and Mode.**

(a) $1,2,4,8$ *(b)* $-4,0,4,0$

(c) $2,4,8,16$ *(d)* $3,0-3,1$

Q.13- **Harmonic Mean of 3,4,8 is**

(a) 1.23 *(b)* 2.23

(c) 3.23 *(d)* 4.23

Q.14- Second quartile of the data is equal to

(a) Mean *(b)* Median *(c)* Mode *(d)* S.D

Q.15- The difference of the largest value and the smallest value of data is called.

(a) Deviation *(b)* Range *(c)* S.D *(d)* Variance

Q.16- The square of standard deviation is called

(a) Variance *(b)* Dispersion
(c) Range *(d)* Mean

MODEL CLASS TEST

Time : 40 mins Max Marks : 25

Q.1- Tich the best choice.

(i) Mode of the data $2,5,7,3,6$ is

(a) Mode does not exist *(b) 5* *(c) 6* *(d) 5.3*

(ii) The middle value of data arranged in numerical order is called

(a) Mode *(b)* Median
(c) Mean *(d)* Geometric Mean

(iii) $\dfrac{\sum wx}{\sum w} = ?$

(a) Arithmetic Mean *(b)* Weighted Mean
(c) Geometric Mean *(d)* Harmonic Mean

(iv) $\dfrac{n}{\sum \frac{1}{x}}$ is called

(a) Harmonic Mean *(b)* Median
(c) Mode *(d)* Mean

(v) Geometric Mean of $2,4,8$ is

(a) *3* *(b)* *4*
(c) *5* *(d)* *6*

(vi) A data has *10* terms whose arithmetic mean is *165*. The sum of all the terms is

(a) 16.5 *(b) 175* *(c) 1650* *(d) 155*

(vii) *3* is the ___ of the data *2,3,6*

(a) A.M *(b)* H.M *(c)* G.M *(d)* Mode.

Q.2- Attempt any five of the following short questions.

(i) Define arithmetic mean of data $x_1, x_2, x_3, \ldots x_n$

(ii) Find A.M, Median and Mode of *4,10,7,7,9,5*

(iii) Find Standard Deviation of *4,6,11*

(iv) Consider the data *184,191,172,193,195* and take assumed mean $A = 180$, Find arithmetic mean.

(v) Mode of a data does not exist. Explain this statement.

(vi) Geometric Mean of a data is Zero. What is meant by this statement.

(vii) Find range of data *"2,5,3,8,6,9,15,1,20"* Attempt any two of the following long questions.

Q.3- Construct cumulative frequency polygon.

Classes	*5-10*	*10-15*	*15-20*	*20-25*	*25-30*
Frequency	*10*	*15*	*20*	*30*	*15*

Q.4- Draw the histogram

Marks	*1-20*	*21-40*	*41-60*	*61-80*	*81-100*
Frequency	*2*	*4*	*19*	*12*	*3*

Q.5- Find the arithmetic, geometric and harmonic means of 3,4,8.

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